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THE BRICKBUILDER.

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ADVERTISING.

Advertisers are classified and arranged in the following order: —

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Advertisements will be printed on cover pages only.

THERE is a lot of outdoor work which is directly in the line of architectural study; and when the temperature in the office is too high for serious book study or work with drawing board and T square, it well repays the earnest student to go out in the country and study form and composition as he can find it in plant life. We had occasion a few days since to examine some of the summer work of students in a neighboring school, which was devoted primarily to the arts. The work of one student was remarkable in that he managed to get so much real, positive, helpful study from the simpler plant forms. This is something which is easier to illustrate by example than by precept, but every architect knows how much of the vegetable kingdom can be directly assimilated in the architectural world in detail, and how important it is to freshen one's perceptions by going back as it were to the fountain head of decorative work and study nature. The only trouble is in our vacation days we easily confound simple loitering and admiring of a pretty plant with the careful reasoning examination and analysis which can be productive of so much architectural good. Most of us loiter our vacations away, and regret it when the fall and its new problems come in on us unawares. But looked at aright, a hot season and the country life afford a valuable opportunity for a kind of serious study which we are only too prone to ignore.

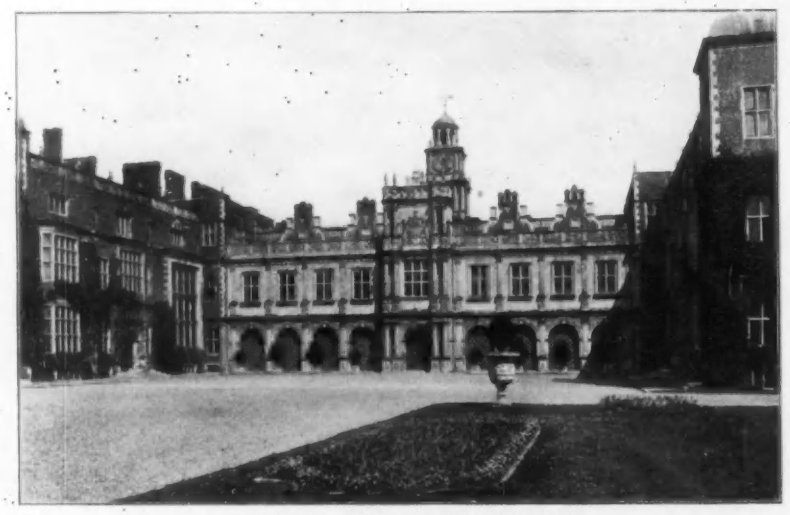
THE question is sometimes asked by our too impatient friends, Why is it this country does not produce more and better brick buildings? That we will ever know the full answer to such a query is hardly likely. We certainly admit the limitations of our brick architecture as well as those of buildings erected in a less pliable and permanent material, and it is to be hoped that the time may never come when we cannot see possibilities of improvement even in the best of our work. But granting for the moment that the difficulty lies not wholly with the mere ability of our designers, there are, it seems to us, some explanations, or, perhaps, more truly, some possibilities of improvement in the design and increase in the quantity of our terra-cotta and brick architecture. When an architect is entrusted with a commission for a large, prominent building, the temptation to select at once the material which is popularly associated with the architectural triumphs of so much of the old world is sometimes too strong to be resisted. He feels that this may be his only chance, and that if he can only persuade his client to be sufficiently complacent, he, the architect, may be more sure of his ground and of his results by using stone than by attempting brick and terra-cotta. Then sometimes we are a bit lazy, and it is easier to copy, or at least we think so, than to bend ourselves to the really difficult task of properly designing a burnt-clay structure. An architect will often lack the courage of his own convictions, and though he may know that brick is the proper material to use, will run off into free stone or granite because his client tells him to do so. Indeed, the architect who, becoming thoroughly convinced that brick or terra-cotta should be used under certain conditions, will resolutely impose his convictions upon his client, is rare. There is no lack of abundant demonstration, however, that the difficulty lies almost wholly with the intent of the architect, and not with the material. Four of the most successful recent buildings in this country are the Horticultural Hall, Philadelphia, by Frank Miles Day; the Natural History Museum in the same city by the same architect in conjunction with Wilson Eyre and Cope & Stewardson; the Broadway Chambers, New York City, by Cass Gilbert; and the Horticultural Hall, Boston, by E. M. Wheelwright. All of these structures are built of brick. Nor does this by any means exhaust the list. Monumental, impressive buildings in brick have come to stay, and if we are asked why we do not have more of them, we would reply, give us time and the courage of our convictions, and they will come.

Old English Brickwork. II.

BY W. G. HORSEMAN AND HENRY TANNER, JR.

THE second period in the history of brickwork in this country was, broadly speaking, from and including the time of Queen Elizabeth to that of Inigo Jones, through that time of chaos in architecture when the mason or carpenter probably undertook the work of designing as well as the erection of the buildings upon which they were employed, under frequently the direct supervision of the employer; when men like Abel of Herefordshire, Thomas Holt of Oxford, both of them carpenters, and Simons and Wigge of Cambridge were the nearest approach to the present-day architect. John Thorpe and the Smithsons, being almost the only men whose names have come down to us as acting in the true position of architect as we know it.

Brickwork had ceased to be much employed ornamentally after the time of Henry VIII., through whose long reign it and terra-cotta had been very freely used for the execution of moldings, window tracery, copings, etc., but from the middle of the sixteenth to the latter half of the seventeenth century it was



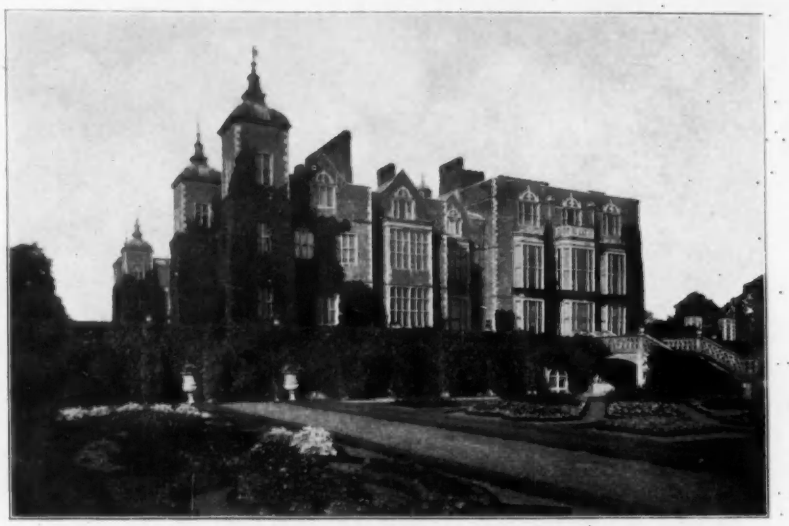
HATFIELD HOUSE, HERTFORDSHIRE.

very rarely used except for plain walling, stone being very generally used for dressings in every position, as in the case of large houses such as Blickling Hall in Norfolk, Moyns Park in Essex, Kentwell Hall and Long Melford Hall in Suffolk, Hatfield House in Hertfordshire, Aston Hall in Warwickshire, and Bramshill House in Hampshire, which are a few examples out of very many of its use in this manner.

Many, however, of the smaller and less important country houses built during this period are constructed entirely of brickwork, and furnish good examples of its use ornamentally in their door and window dressings, string-courses, gables, parapets, copings, and chimney-stacks.

The reign of Queen Elizabeth was a time of great building activity, the material used being chiefly the red bricks, which have weathered by time to a beautiful color, and, as we know them, add so much charm to our English landscapes, and are so characteristic of them.

A friendly spirit of rivalry was abroad as to the possession of the most magnificent house, the largest rooms, or the longest gallery (this latter feature so character-

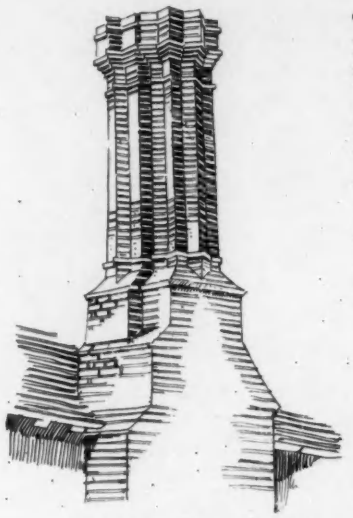


HATFIELD HOUSE, HERTFORDSHIRE.

istic of these houses), a spirit which was bound to give an immense impetus to building, and which fortunately for us was productive of better results than that which occurred later, in the history of our Renaissance, when good, honest brickwork was thought to be too mean a material for use in the great showy houses — such as were built in vast numbers in the eighteenth century — except as a core to be plastered over in imitation of stone in those cases where the use of stone dressings was found to be too costly, and the effect of stone had to be obtained somehow.

This, too, was a period of fanciful houses, both as regards plan and elevation, such as some of those designed by John Thorpe and Sir Thomas Tresham. The triangular lodge at Rushton, in Northamptonshire, and the house designed by Thorpe on the lines of his

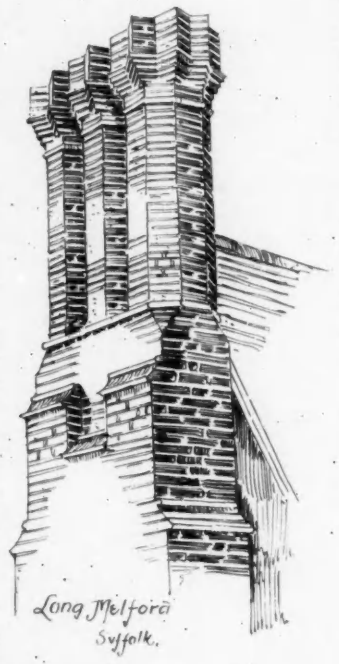
GREAT TANGLEY MANOR HOUSE, SURREY.



CHIMNEY-STACK, WHEATHAMPSTEAD, HERTFORDSHIRE.

own initials are good examples of the eccentricities prevalent at this period.

Great impetus was given to the use of brick as a building material by the growing scarcity of wood in English forests, a fact which caused much uneasiness, and into which inquiry was made at the time: the iron works in Kent and Sussex being responsible, in a large measure, for much of the destruction of wood by using great quantities as fuel for their furnaces.



The consequence was that half-timber building was discontinued, a method of building which was almost universal throughout the wooded tracts of country, and even largely used in London, until in A. D. 1605 James I. issued a proclamation forbidding buildings to be erected in London, except of brick or stone, the great advantages and increased safety of the houses built of these materials being then understood.

Brick was much used as a filling in between the studs in half-timber work; the Deans Cloister, at Windsor, though now rebuilt, and exactly on the old lines, a very good example of this method, the brick filling being put in herring-bone fashion.

Shrewsbury and Worcester furnish us with many examples of this kind of work, the one illustrated here being a typical example, the brick corbelling over the doorway being interesting and picturesque even if not very architectural. It is also very prevalent in the smaller domestic houses and cottages in the counties of Kent, Sussex, and Surrey, and to a lesser extent in Norfolk, Suffolk, and Essex.

At Great Tangley Manor House, in Surrey, though most of the house is timber and plaster, there are parts, as our illustration here shows, where brick is used in conjunction with the timber; the great square brick chimney-stacks also add greatly to the picturesque effect of the charming spot.

Brick chimneys, again, are a history in themselves, showing in their varying forms, from the large square single flue to the highly ornamental groups of chimneys, such as we see at Hampton Court Palace, the progress made, both in design and scientific construction.

The earliest-known example of a chimney in England is most probably the circular chimney-stack of the king's house, at Christchurch, in Hampshire, a ruined building of Norman date; but at this early period chimney-shafts were doubtless the exception and not the rule, and at Rochester Castle, in Kent, also a building of Norman date, the flues from the fireplaces are continued vertically up in the thickness of the external walls for a short distance, and then turned horizontally through the wall, showing on the outside face merely a square aperture, a method probably productive of much smoke and discomfort in the rooms.

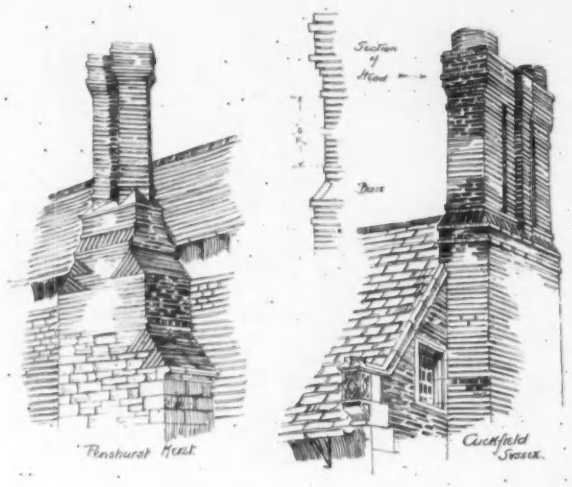
The plans of the smaller domestic buildings were simple in the extreme: a large apartment formed the hall, which was generally used for living and even sleeping in. There also was a kitchen and usually an apartment off the hall, called the "solar," perhaps, devoted to the use of the female inhabitants of the house. These apartments generally had fireplaces and chimneys, but in many cases a lantern upon the roof carried off the smoke from the hall fire, which often was on a raised hearth in the center of the floor.

At a later date when the need of greater privacy and

THE SICK HOUSE, WINCHESTER COLLEGE.

THE DEANERY, WINCHESTER.

comfort was recognized, more rooms were added, and the necessity for a large hall no longer existed; it became the usual expedient to insert a floor at a convenient height,



dividing the hall into two stories, thus increasing the accommodation.

The same feeling which prompted this extension of plan also required the comfort to be obtained by the

CHARLTON HOUSE, KENT.

more general construction of fireplaces, and, consequently, chimney-stacks.

Brick chimney-stacks seem to have come into very general use about A. D. 1500. Many extremely beautiful

examples still exist in buildings of much earlier date, but in most cases these are of stone.

Chimney-stacks may be broadly divided into two types — internal and external stacks — and from the usual plan of having a huge recessed fireplace or ingle nook upon the ground floor, were frequently of large dimensions, the effect of which, when seen, as in the case of an external stack, is very fine.

Early brick chimneys were generally grouped in rows upon square bases, which rise well above the roofs.

MOYNES PARK, ESSEX.

The plans of the shafts enclosing the flues are of very varied form — circles, octagons, and hexagons, — and these again were varied by having their sides curved, on plan, or again the moldings of an octagon or hexagon chimney-shaft were worked spirally from base to cap. The walls or shafts containing the flues were at first invariably separate, only being united by the projection of the cap and base molds, as the chimneys of Eton College, Hampton Court Palace, Eastbury House, near Barking, and Penshurst Castle, in Kent, which very well illustrate the mastery the brickbuilder had attained over his materials.

BRAMSHILL, HAMPSHIRE.

By degrees the flues were diminished in size, and their enclosing walls in the chimney-shaft proper were connected at first so slightly as still to give the appearance of detached shafts, as the chimney-stack illustrated from Wheathampstead in Hertfordshire, which has three flues grouped together, the chimney-stack from Long Melford, or the very fine early example at East Barsham in Norfolk, a prototype of the many rubbed brick

ENTRANCE GATE, PEMBERTON'S ALMSHOUSES, ST. ALBANS, HERTFORDSHIRE.

chimneys which were afterwards built in this country. Towards the middle of the seventeenth century the flues in many houses were often carried up together in one large square stack, and this was simply paneled on each face. The chimneys of the Deanery, at Winchester, and the old Sick House or Infirmary of the college at the same place are good examples of this variety of finish.

It is also interesting to note that brick was very generally used, on account of its adaptability and ease of manipulation, in some of the very beautiful Kent and Sussex country houses for the construction of the chimney-shafts proper. Even when the lower part of the stack consisted of masonry, the upper part was often built with bricks. This method of building is probably due to the fact that the stone employed in building these houses was hardly suitable for the construction of chimneys, but whatever the cause, the present effect of these brick chimneys upon stone bases or walling is very charming.

The chimney-stack from Penshurst, Kent, here illustrated, is a good example of this.

The villages in the counties of Kent, Surrey, and Sussex abound in many varied examples of the plainer forms of chimney-stacks, many of which are worthy of illustration, and would amply repay careful study.

MANOR HOUSE, EXAMPLE OF STEPPED GABLE.

The caps of these simpler types are generally formed of the ordinary walling bricks, rubbed or molded brick being of very rare occurrence in these cottage buildings. The two simple forms, here illustrated, are from Udimore in Sussex, and Kilndown in Kent. It was a very common practice to project one course of brickwork along each side of a chimney-stack immediately above the roof line and to fill in the space from the under side of this projecting brick to the tiles of the roof with mortar; this method obviated the necessity of lead, which at that time was very expensive for flashings, and apart from this reason adds much charm to the effect of the chimney-stack.

ALMSHOUSE, KING'S LYNN.

LAYER MARNEY, ESSEX.

The long bay windows running up the whole height of the house were especially typical features of this period. They were, it is true, built with stone dressings and window jambs, etc., but brick was the body of the structure, the one material setting off the other with splendid effect.

At Moynes Park, in Essex, built in about A. D. 1580, the gables and bays are alternated, a distribution of parts somewhat unusual to find, but which looks in this instance extremely well. The chimney-stacks here, also, are very lofty, and have molded brick caps and bases.

Blickling Hall, near Aylsham, in Norfolk, is one of the many beautiful Elizabethan houses of red brick with stone dressings, with great chimney-stacks, long bays, and curved gables. The bay windows on the east front are alternately canted and square. It was built in A. D. 1619 or A. D. 1620. A moat running along the front, over which the main entrance is approached by a bridge of brick and stone, and the square angle towers at each end of this front are features of very frequent occurrence in houses of this time.

Charlton House, near Woolwich, in Kent, is another typical house of this period. Here the roofs do not show, and the walls are crowned with an elaborately pierced parapet. The date of this house is about A. D. 1607.

Bramshill, in Hampshire, was built upon the site of an older house, John Thorpe being very generally supposed to have been responsible for it, although it has been assigned to the hand of Inigo Jones.

It is like a flat H on plan, and is built of brick, with dressings of Headington stone. With the exception of the front entrance, the work is of plain character. Much of its effect is gained by flat stretches of wall, pierced by many mullioned bay windows running up in this instance to the pierced parapet, which crowns the walls and is carried round the heads of these bays as a finish. The

RESTORATION HOUSE, ROCHESTER.

bays, here illustrated, are those of the front overlooking the terrace walk and bowling green.

Hatfield House, in Hertfordshire, is another remarkably fine house of this period, and, like Bramshill, is built upon the H plan. The south front has angle towers much after the design of those at Blickling. Hatfield was erected by Sir Robert Cecil, between the years A. D. 1605 and A. D. 1611.

Another characteristic building is that of Ham House, near Richmond (Surrey), built in A. D. 1610.

Eastbury House, near Barking, in Essex, is a smaller type of house, built entirely of red brick, the mullions, window jambs, and gable copings being of that material.

The window jambs in this case have been plastered over in imitation of stone quoins. Possibly, at a later date, this has also been done in other cases; for instance, the windows of Seckford Hall, in Suffolk, where there is some cut and molded brickwork of this date in the jambs and mullions of the windows.

Some almshouses at Audley End, near Saffron Walden, in Essex, have much good brickwork of the same period.

At St. Albans, in Hertfordshire, the entrance gateway of Pemberton's almshouses is worth notice, and in the village of Flamstead, six miles away, the almshouses are built entirely of red brick, the copings and finials being particularly good.

RESTORATION HOUSE, ROCHESTER.

Water End Manor House, a small country house near Wheathampstead, in the same county, is also a good example of this date, and likewise has copings, strings, and finials executed in molded brick, as are the caps and bases of the very perfect and beautiful chimney-stacks.

The almshouses at Harefield, near Uxbridge, present another good example. They are built around three sides of a small quadrangle, and have the characteristic chimneys of the period. The springers to the gables in cut brickwork are especially instructive.

At King's Lynn, in Norfolk, the almshouses, here illustrated, are built entirely in brickwork. The gables are

ST. JOHN'S COLLEGE, CAMBRIDGE.

very simply treated with plain hollow curves, finishing with a flat pediment.

The gables of this period were treated in many and various ways, and were perhaps the most thoroughly typical feature, as they afterwards fell into disuse, owing to the increasing influence of the classic school whose chief if not sole idea of the way to finish a building was to run a parapet round the summit of its walls, keeping the roof and chimneys as much out of sight as possible.

The earliest form was the stepped gable, doubtless of Flemish origin, which afterwards gave way to those formed of segments of circles and curves.

The stepped gable was common throughout the eastern counties, and is also to be found in some places in Kent and Sussex. The gateway from Canterbury, previously illustrated, has this form of gable.

St. John's College, Cambridge, has some extremely good examples of the later segmental gables.

Restoration House, Rochester, also has gables of this type.

The gables on the south front of Mackeraye

MACKERAYE END HOUSE, HERTFORDSHIRE.

End Manor House, near Wheathampstead, in Hertfordshire, present another variety of this form. In this instance, a flattish pediment forms the crowning member of the gable.

Perfectly straight gables were also often built in brick. Those at Water End Manor House and the almshouses at Flamstead, both places in Hertfordshire, are formed with molded bricks, as also are the springers and the finials which sit upon these and the apex. The gables of Moynes Park, Essex, are another instance of this form.

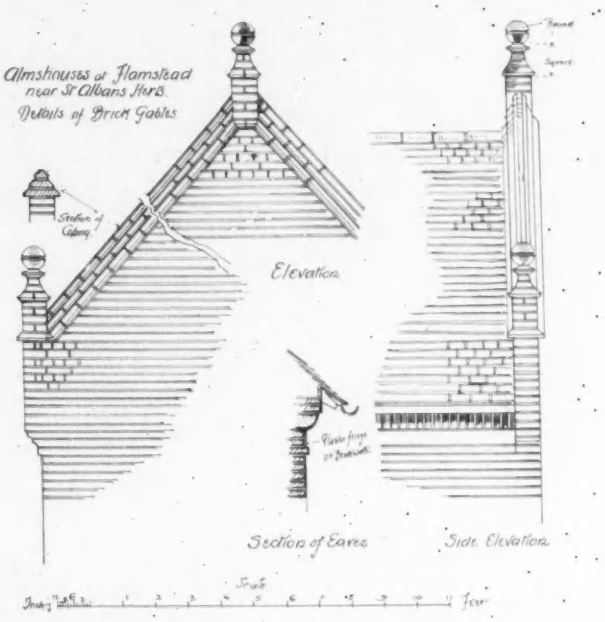
MOYNES PARK.

The large houses of this date were generally surrounded by extensive and elaborately laid out formal gardens, the protecting walls of which were frequently built in brick. At Byfleet Manor House, in Surrey, the forecourt walls, here illustrated, still remain; the walls here are 14 ins. thick, but from the treatment of the broad, sloped coping have a fine and massive appearance, giving a feeling of strength and security to the enclosed space.

The almshouses at St. Albans, already referred to, are set back from the main road within a forecourt enclosed by brick walls, the entrance gateway in which is a good example of work of this period.

Brickwork is not very often to be found in ecclesiastical structures of this period, indeed very few churches were founded, or even added to, at this time, and in most towns and parishes the existing churches probably amply sufficed for the needs of the population.

The illustration of Feering Church, Essex, shows part of the aisle and porch which are entirely built of brick, and though possibly rather earlier in date than the period we have been considering, it is too excellent an



example to be passed over. The moldings of arches of porch, jambs, and mullions are executed in molded bricks, as are the battlements and cusped corbel table under. The gable of the porch is of the stepped variety already referred to.

SHREWSBURY.

Examples of brickwork with half timber construction.

"The Brickbuilder" Competition.
VII.
AN ENTRANCE TO A CITY PARK.
CRITICISM AND AWARD.

BY HENRY BACON.

PROGRAM.

THE municipal authorities of a large city, in the residential portion of which is a park, have condemned adjacent property for the purpose of enlarging the park.

The present park is bordered by wide streets, devoted to traffic and car lines, none of which can be closed.

The addition to the park will be rectangular, of the same width as the present park, and separated from it by one of the streets which runs from east to west.

The purpose of this competition is to provide an entrance to each of the portions of the enlarged park, at the west end of the intersecting street, and to so treat the street that its commercial character will disappear as much as possible.

The park ground is undulating, and the general character of the roads and planting is rural.

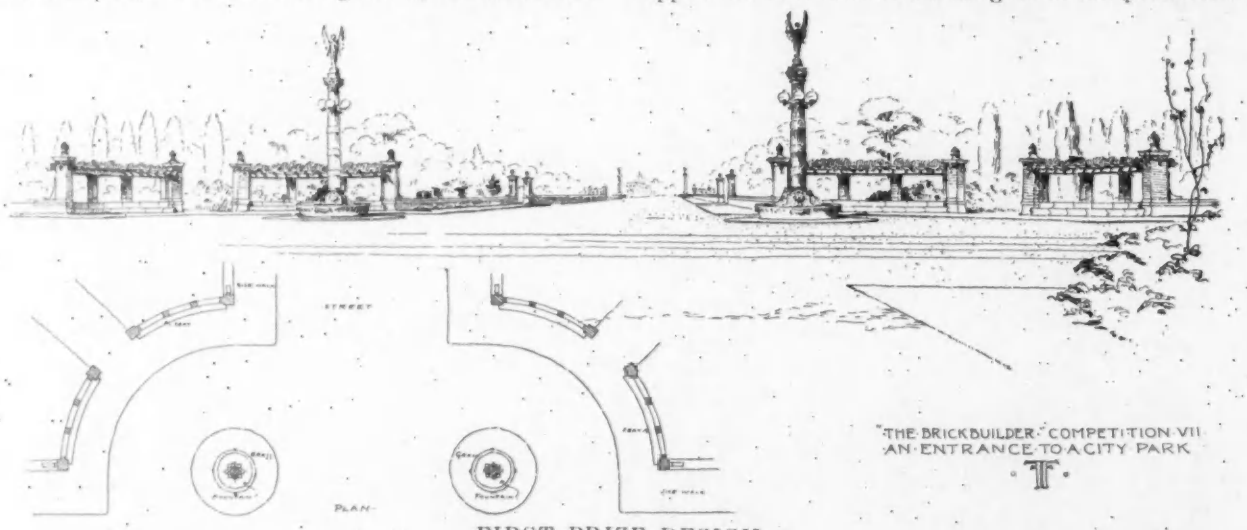
The design for the entrance is to be such as is adapted to working out in burnt clay products.

Most of the designs submitted are far below the standard that might be reasonably expected, considering the requirements of the competition, and, though some show a certain excellence of conception of the general scheme and others a good expression of detail, none of them present a satisfactory solution from all points of view.

Of the designs submitted in this competition five have been selected for criticism.

The design placed first is marked by the symbol "FF." In general plan this design is broad and simple, giving ample space for the uses noted in the program for the competition. The general view of this design is pleasing, and shows a generous space given up by the park to the street, an excellent feature which is too often overlooked in the design of park entrances. The space between the sidewalks and fountains is well adapted for the avoidance of congestion, and the fountains and pergolas shading the seats at each side of the entrances to the two sections of the park are useful and agreeable features. On the other hand, the two columns surmounted by figures are not of a character which would be best perpetuated in the material called for in the program. The design would be better if the fountains were enlarged and the columns either omitted entirely or replaced by piers treated in a manner more suited to the materials prescribed.

The design placed second, designated by a capital, shows a knowledge of detail superior to that evidenced by any of the other competitors. This design is excellent from all points of view except one, which is that it is too small in scope for the large site. The materials, brick and terra-cotta, are employed with a good understanding of the principles which underlie their proper use, and none of the other designs, including the first, approach the scheme of the designer in this particular.



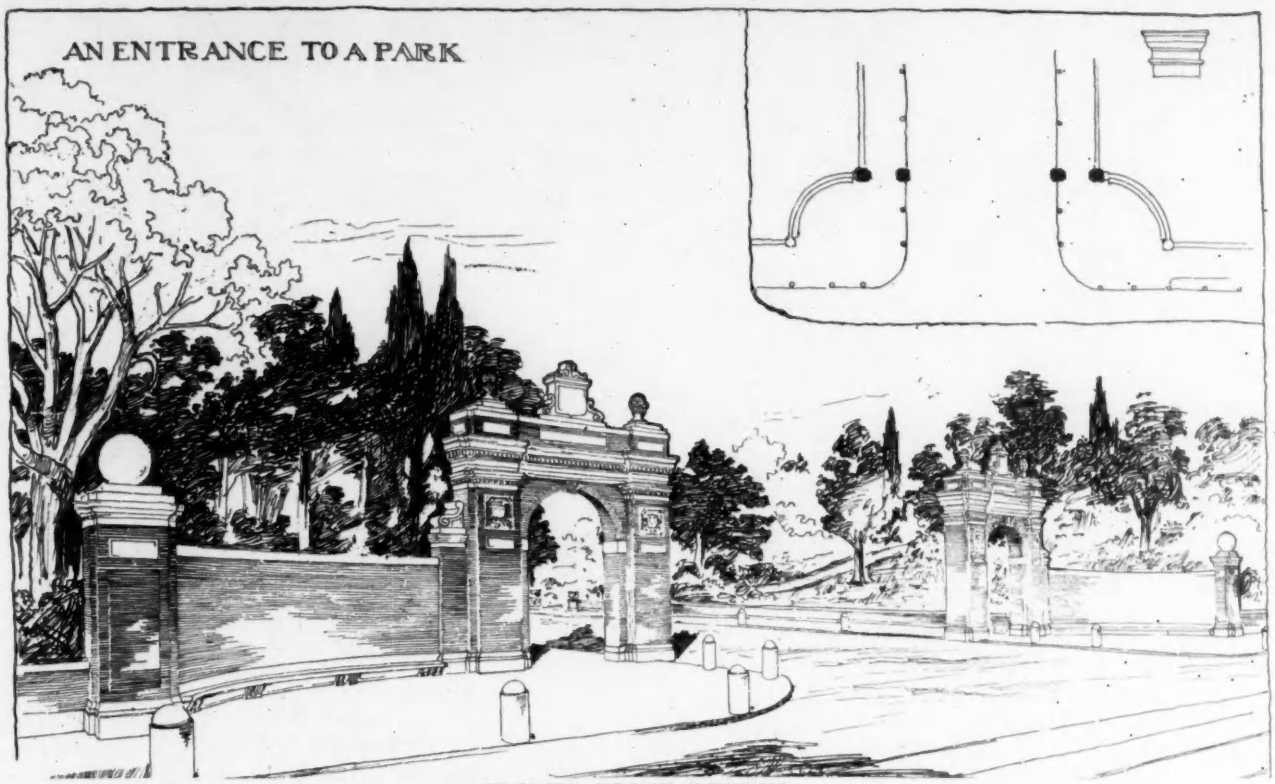
FIRST PRIZE DESIGN.
W. Pell Pulis, New York, N. Y.

The entrance to the two sections of the park are not as distinctly placed as in the design submitted by "FF," nor is the space devoted to the intersecting street so planned as to give the right expression to its voluminous use. The plan of entrance in this design and the other designs criticized, with the exception of the one placed first, does not give the freedom for traffic provided in the latter.

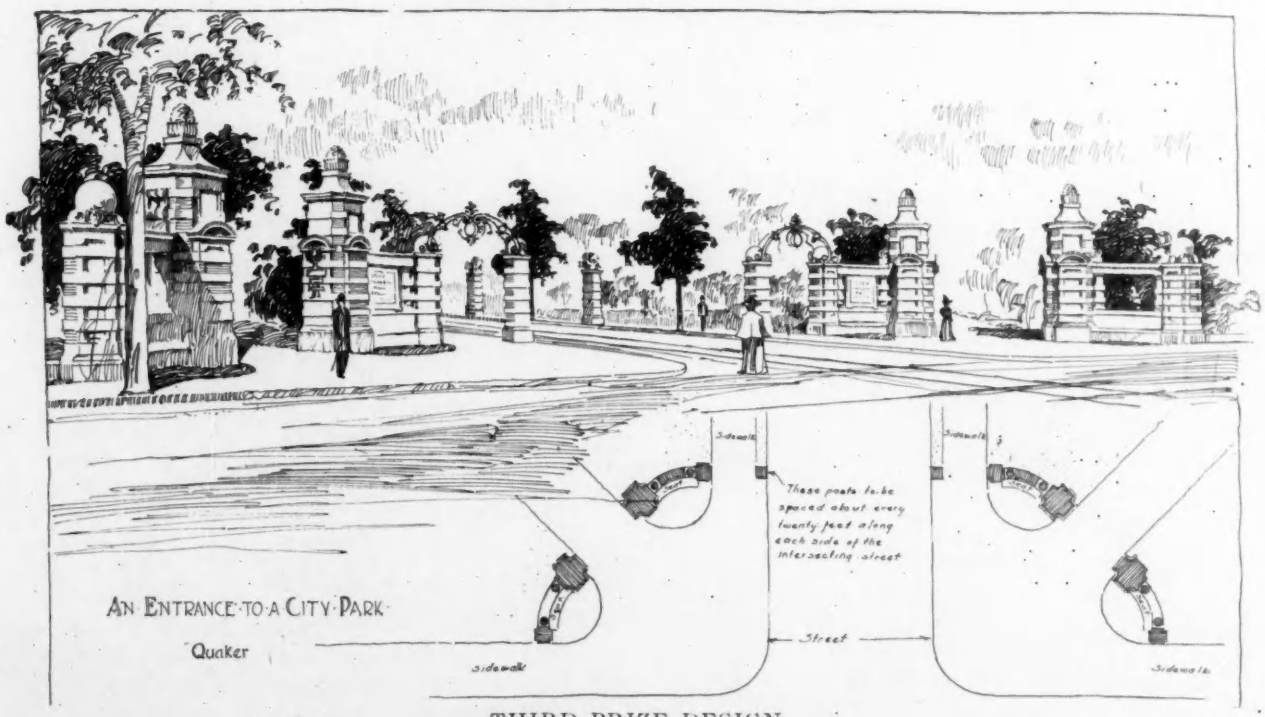
The design by "Quaker," placed third, is simple and orderly, but falls short of the first two designs in conception and detail. The entrance to the two sections of the park are as well placed as those in the design placed first, but there is no climax in the composition, and the proportion of terra-cotta to brick is too great for a successful result.

The design by "Old Virginia," placed fourth, is of a character that would be more appropriate for an entrance to a private institution. The minor entrances are too small, the curved ramps between the large and small posts are in poor taste, and the vases and lamps on these posts are of a severely contrasting variety.

The design by "Pipe Dreams" is placed fifth, and,



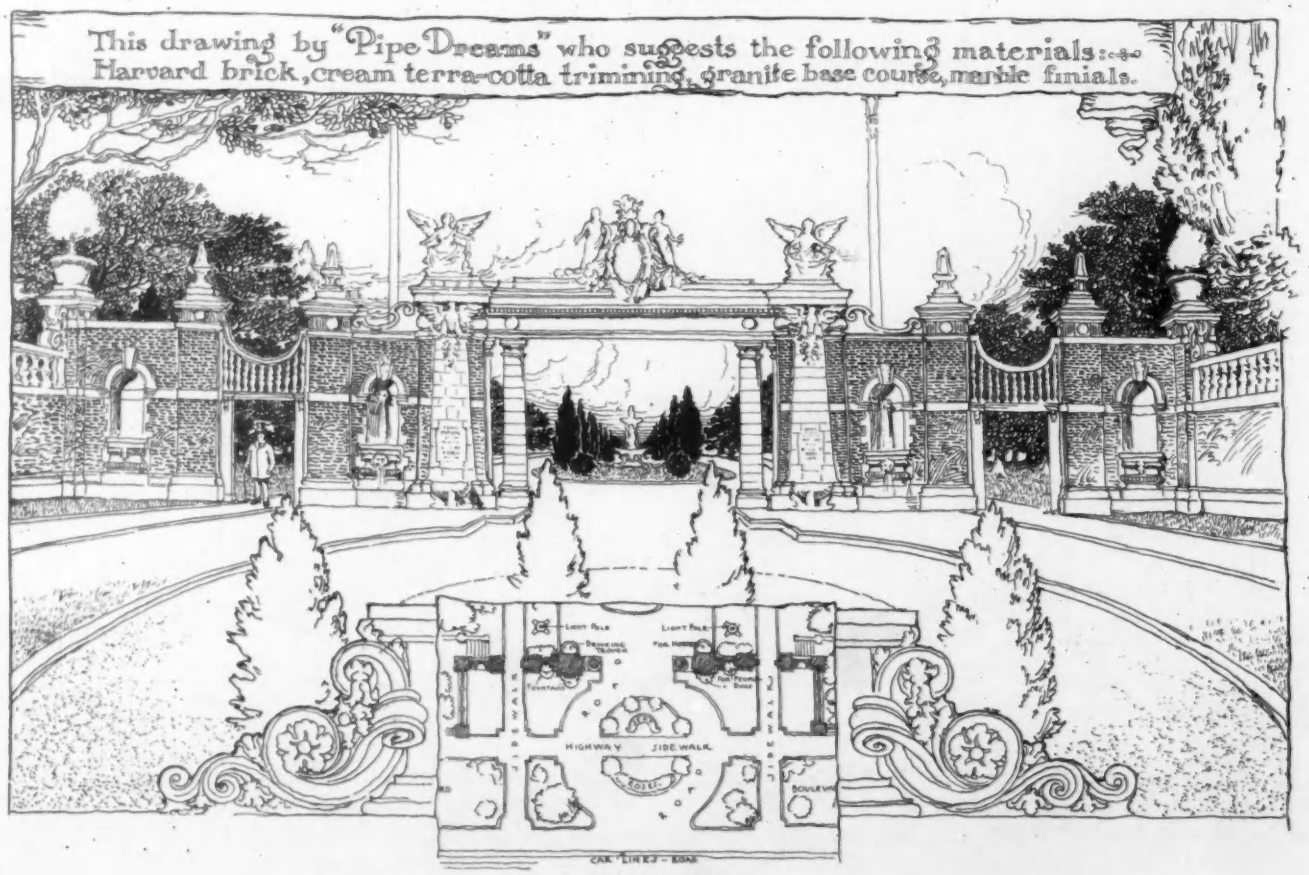
SECOND PRIZE DESIGN.
H. K. Jones, Pittsburgh, Pa.


AN ENTRANCE TO A CITY PARK
Quaker
These posts to be spaced about every twenty feet along each side of the intersecting street
Street
Sidewalk

THIRD PRIZE DESIGN.
Robert C. Heath, Germantown, Pa.

like that placed fourth, is too small for the purpose. The character of the central opening is not in keeping with that of the rest of the design, and the large beam surmounted by a cartouche over the two columns indicates too clearly the use in its interior of the iron necessary for its support. The bad proportions of this opening are a good illustration of the error into which it is easy to fall by too intent a consideration of the practical use of iron in designing masonry. The plan of the intersecting street is tortuous, and the whole scheme is more restricted in spacing than any of the other designs submitted.

FOURTH PRIZE DESIGN.
FRANCIS S. SWALES, DETROIT, MICH.


This drawing by "Pipe Dreams" who suggests the following materials:—
Harvard brick, cream terra-cotta trimming, granite base course, marble finials.
HIGHWAY
SIDEWALK

MENTION.
FRANCIS S. SWALES, DETROIT, MICH.

Modern Architecture.

(Continued from June number.)

If we look around with unprejudiced eyes, and see how art moves everywhere, how artists toil in forming new ideals of beauty, and we consider what has been already accomplished, then must we be convinced *that between the modern and the Renaissance there now extends a wider gulf than that between the Renaissance and the antique.*

COMPOSITION.

As already indicated by the word, art is ability or power, elevated to perfection by a few of the elect, and furnishing beauty with a perceptible expression. If this expression be received by the eye, this power corresponds to the conception of formative arts. Of the formative arts, painting and sculpture always have their models in nature, while architecture has man's creative power as a direct basis, and it is able to present its product as an entirely new creation. The primitive germ of this new creation has its fruitful soil in human life; to this is related the problem, which art must solve by means of the architect. This problem is to correctly recognize the requirements of mankind, and it is the first basal condition of successful creation by the architect.

The beginning of all architectural creation is composition. It is well known that a recipe for an architectural composition cannot be given; yet in considering what has been said, the following may serve as the commencing point of composition. Before taking up the pencil, a good and great conception is to be studied and thoroughly considered. Whether it appears as a lightning flash or slowly reveals itself, whether it be worthy of deep thought and refining, whether on first being worked out it appears a prize or a blank, or whether it must repeatedly be commenced anew, all these are of no importance. But this is certain, that a happy idea as a basis and its perfect mental evolution are of far greater importance to-day and contribute more to the appreciation of a work than the most lavish ornamentation produced by the natural and unconscious powers of the artist.

A certain practical element, with which mankind is now saturated, cannot be created without reference to the world, and every artist must eventually conform to the law: *Anything that is unpractical can never be beautiful!*

After grasping the basal idea, it is further important to note the requirements according to the program for the building, and to arrange these clearly together, thus producing the skeleton of the edifice. This arranging must follow the development of the ground plan, which concerns the building in the most important way, and we must proceed with the aim to produce the clearest and simplest solution by making prominent rooms and masses in an empirical way, until a so-called academic ground plan or type of building results. The simple arrangement of the plan will always aid orientation in the building and the required economical construction of the edifice. It is evident that the external form of the building must keep equal pace with this planning. Such a mode of procedure is advisable in every architectural design and is indispensable in competitions, if any result is expected.

It must always be deemed a great error to adapt the required internal structure to a favorite external motive, or to sacrifice it thereto. Falsity is then unavoidable, and the resulting form has a repugnant effect. An apartment house for renting, which parades projections without apparent motive, towers, and domes, or prides itself on having the appearance of a palace, as well as the so-called stylish furniture, on which one sits with discomfort, both alike have the same foolish effect, and are merely artistic lies.

Every composition will essentially be influenced by the material in which it is executed and by the technical skill applied to it. This will be discussed later, and is merely mentioned here, because composition must always adapt itself to materials and workmanship, and not conversely. The composition must also very plainly show the materials for its execution, and the mode of working them. This is true, whether for a monumental edifice, or for the design of the smallest ornamental object.

But composition is plainly connected with many other things. The most important are the pecuniary means at command, the geographical location, the special attention to be paid to that locality, the probable duration of use, esthetic suitability to its surroundings, and an external appearance entirely corresponding to its internal construction. In the cases mentioned, an endeavor to express truth must be the guiding star of the architect; then characteristic treatment and a symbolism of the work arise naturally; in the church will appear sanctity, purpose and dignity in the building for government purposes, and cheerfulness in the edifice for amusement.

But too frequently must the composition comprise the entire object produced, and the desired opportunity is then offered to the architect for influencing and deciding by his abilities those points, such as heightening the effect, preparation for the view, creation of resting points for the eye, etc. Our modern era is very susceptible to grand effects, which are caused by the previously unknown congregating of men in large cities, and this supplies the motive for a certain noble impulse, which frequently permeates modern creations. It may then be stated with great satisfaction, that in the arrangement of the general design, of the squares and streets, in the location of monuments, and in the consideration of avenues, entirely aside from great structural creations, the vast advance in engineering science has made results possible, and our modern art has created works, beside which neither the Renaissance nor the antique can place their equals.

Here should we loudly cry "Forward" to the modern creating architect, and warn him against too great and too devout adoration of the Ancient, so that although modest, his self-consciousness may again appear, without which a great work cannot usually be produced.

To composition likewise belongs the higher treatment of architecture. By this is meant a proper cooperation with the sister arts of sculpture and painting. The architect should never lay down the supreme command. Whether it concerns the external or internal ornamenta-

tion of his work, or art monuments are to adorn more extensive designs, streets, and squares, the architect must alone and always be the leader, since everything must be subordinated to the basal conception made by the architect. Errors of this kind in art monuments become very apparent and constantly occur. Every art monument is an integral portion of the square on which it is intended to stand, since the square must exist before the monument is designed for it; thus the square is not created for the monument, but conversely.

All such mistakes are always charged to the executing artist, and they usually occur because the monument was designed before its location was fixed, or the artist adopted the too common opinion that the work must be considered by itself alone, instead of adapting it to the dimensions of the square, the height of the enclosed space, or the outline of the background. It must be said that the architect will generally decide on such points more correctly than will the sculptor or painter. Similar importance must be placed by the architect on the magnitude of statues in relation to the building and to each other; it is immaterial whether they adorn a square, a building, or a room, are executed in relief, or in the round.

To composition further belongs artistic economy. By this is meant moderation in the application and treatment of forms transmitted to us, which corresponds to modern ideas and extends to extreme limits. This is especially true of forms, which are accepted as lofty expressions of artistic conception and elevated feeling, such as domes, towers, quadrigas, columns, etc. Such forms are generally only clearly sketched out and are sparingly employed, since their too frequent use would always produce an inverse effect. A simple and practical basis must be our point of view, if the work is to be a faithful reflection of our era, fully and completely expressed.

Not to weaken these principles, but to come nearer truth in design, it must be emphasized that architects in different countries have to employ forms of more or less richness to express local characteristics. It is only logical that the South Germans, the French, or the Italians must have different ideals of beauty, and composition should go so far in the endeavor after true modes of expression that even the period and fashion may be properly emphasized; all enduring art-works are thus adapted with tolerable accuracy to their time and location.

This is the place for a careful consideration of the points mentioned in this work as plainly influencing composition, so that in different places are found differences in the artistic expression of the object. It is further certain that the national element has only entered into art in this natural way. From the similarity of the modes of life of peoples in civilized countries, these diversities will never be great. For these reasons, an obstinate adherence to ancient styles for certain monuments, or the selection of an antique style for a certain people, may be termed a fad, even although Germans are very well suited by a portion of what is known as the "Old German" style.

It cannot be the object of this essay to illustrate everything relating to composition, nor is it possible to restrict it within a domain in which any subject is classed. Hence, much that has been said must be extended by the reader. Limited to the most important ideas, space may be found for the following.

A simple and clear arrangement of the plan generally requires symmetry of the building. There is something decided, completed, well weighed, incapable of extension, indeed, self-conscious, in a symmetrical design, which is required by earnestness and dignity, the constant attendants of architecture. Only where the form of the site, the purpose of the building, the means at command, or the style to be used make symmetry impossible, is an unsymmetrical solution justifiable. The aping of an unsymmetrical building, or a designedly unsymmetrical composition, to produce a picturesque effect is entirely to be condemned; yet all ancient models of this character originated only because later generations introduced successive alterations into the symmetrical design of the building, causing thus its unsymmetrical form, which was never originally intended.

The designing architect must place great stress on perspective effect, or must so arrange the outlines, the subdivision of the masses, the cornices, the projections and recessions of the masses, the relief of moldings and ornaments, so that they may appear with correct emphasis from a *single point of view*. This point will naturally and most commonly be that from which the work will be most frequently, most easily, and most naturally viewed. Nearly all art monuments show the great weight their creators laid on this principle, since examples occur where the architects limited the distance of vision so as to compel the observer to view the building in this way and not otherwise. Hence, edifices in narrow streets must be quite differently outlined and have ornaments and projections in lower relief than those on wide streets and squares, or such as are to produce an effect at a distance. These forms are so much influenced that an increase of one or two yards in the width of the street must be taken into account.

There are also architectural works in which it is plainly evident that they were designed for two different distances of vision. Many buildings with domes and towers, some triumphal arches, etc., make this apparent. The aim for external effect in such edifices is then two-fold; the façade and its details must satisfy the observer on the square or the street, while the lofty superstructure, with its rich outlines, either forms an integral part of a perspective view, or must harmonize with the view of a city, in order to become a characteristic monument, visible from afar. Especially well designed in this respect are some edifices in the Barocco style, and their study in relation to perspective effect and to well-considered distance of view is therefore warmly commended to the future architect.

Less refined, although always sufficiently finished, are some examples of buildings in the Gothic period. The bringing of Gothic cathedrals into greater prominence by removing adjacent structures is, therefore, very objectionable, although this has been favored of late, because it was certainly not so intended originally, and all such changes have ended in failure. The changed distances of view for the cathedrals of Paris, Cologne, and Milan are eloquent in this matter.

It is a property peculiar to human designs that the eye of the observer of every art work seeks a point of

rest or concentration, because otherwise a painful insecurity or esthetic dislike results. This always causes the architect to arrange such a focal point on which the visual lines of observations may be concentrated. Failure to accent the center of axis of a square, that of a large building or apartment, the perspective view of a street ending in nothing, or any unjustifiable lack of symmetry are all to be classed as faults, since they do not fulfil the preceding requirement.

A more important human peculiarity even more strongly influences architectural composition, and consists in the need and desire for heightening the intellectual effect, and only after this is accomplished does there occur greater satisfaction. The mental reception of the impression made by great monumental designs may be explained, as that the general image is at first indistinctly received, and only after a few moments does the glance and the impression slowly concentrate on a point, in which the outlines, the surroundings, and the general arrangement participate. Then occurs the fixation of the eye. The necessity then first appears for observing the effect of the different parts and of the details by continually changing the point of view. To satisfy such human requirements by artistic creation belongs to the most difficult problems of architecture.

The object created only receives at a late period an unprejudiced judgment, since this results from the long duration of its construction, and the slowly maturing appreciation by the public. The laws by which such problems are to be solved form an integral part of the main ideas of the composition and frequently are a revelation of the creator of such works. They may be said to form the "counterpoint" (theory of harmony) of architecture. A few hints may make this clear. They will show where, among other things, the architect must fix his aim to obtain artistic solutions of such problems.

Constant consideration of horizontal and vertical angles of vision by the observer under every mode of arrangement.

Grouping of separate buildings for general effect.

Utilization of the site and of the landscape background.

Adoption of new, and a correct estimation of existing, perspective views and vistas, both outside and inside the edifice.

In designing a street, continual regard must be paid to the varying views at its ends, which will be presented to the observer.

A properly emphasized and well-placed point for the eye to rest upon.

Correct location and marking of axial breaks, both externally and internally.

Dignified accenting of the ends of important streets.

Well-considered magnitude and importance of buildings and monuments in relation to the forms of cities, squares, and streets.

Clear and easily understood characteristics of the building.

Consideration of the effects of dimensions, of sequence, and of coloring of rooms.

And many other things as well.

If the solutions of such questions are to satisfy the previously stated requirements of mankind, such as desire for enhanced effect, for a carefully arranged point of view, for a point of rest for the eye, for proper limitations of form, and for entire satisfaction, they then demand from the architect high abilities and strenuous thought. The Renaissance and Barocco masters supply excellent examples. Our modern period particularly esteems large dimensions, has often successfully employed such suggestions and traditions, and it has created works which we may regard with justifiable pride. Thus the view from the future central building of the imperial Pacale in Vienna towards the Maria Theresa Square, after the completion of the rear portion according to Semper's immortal design, and the removal of the ancient gateway, will excel all others in effect, in visual arrangement, in well-conceived surroundings, in outlines, and in a resting point for the eye. That these remarks can only influence the future architect, and that they would be entirely useless without artistic treatment, scarcely requires emphasis.

But all qualities indispensable to the architect retire behind imagination and taste, these alone being able to produce those magical results which are required to free and elevate mankind.

CONSTRUCTION.

The necessity for protection against injury by weather, by men and animals, was certainly the earliest occasion and purpose of the building. In the edifice itself is the germ of all construction, whose development progresses with its purpose. Such creation is based on the idea of mere utility, which cannot suffice, for the feeling for beauty is innate in mankind, calls for the aid of art, and makes it the constant companion of construction. Thus arose architecture! The decoration of huts and caves by flowers, boughs, trophies, arms, and memorials certainly aroused the earliest tendency to imitation, and thus originated the earliest art of architecture, which awakened its sister arts of sculpture and painting. Their works are the independent creations of the beautiful.

Requirements, purpose, construction, and idealization are then the primitive germs of artistic life. United in a single conception, they form a necessity for the origin and existence of every art work, and this is the meaning of the words: "*Necessity is the sole mistress of art.*"

Gottfried Semper first directed our attention to this truth (even if he later deviated from it), thus clearly showing the path to be pursued. Requirements and construction keep equal pace with the aspirations of mankind, which majestically progressing art can only follow distantly. A fear lest the principle of mere utility may suppress art is then apparent. This has even led to a contest, unjustly commenced, where persons were of the opinion that the opposition between realism and idealism is insurmountable. The incorrectness of this view is in the assumption that utility may completely supplant ideality, and in the deduction that mankind could live without art; while it is true that utility and realism precede in order to prepare for the works to be executed by art and idealism. From the origin of art to this time, this precedence and this progress have remained the same, as will clearly appear by a glance into the past.

Man's earliest architectural form was the roof, the protecting ceiling, certainly used as a substitute for non-existent caves. It preceded pillars, walls, and even the hearth, being succeeded by supports artificially built of trees or stones, later followed by wattled work forming the wall or partition. These elements received a further development in permanent settlements by tools and by natural accidents. Traditions, a continual addition of new purposes and new materials, together with the art innate in man, after an infinite period of development, all these have generally raised to artistic forms the primitive shapes of pillars, walls, rafters, etc. Only in this manner can prehistoric art have arisen. No doubt can exist concerning the accuracy of this statement. Besides, if we examine all art forms of historical periods an almost unbroken course of general progress from the era of their *structural* origin until the present may easily be proved to exist. Logical reflection must, therefore, lead us to the conviction that this law is *unavoidable*: "*Every architectural form was produced by construction, and it has gradually become an art form.*" This primary law bears all analyses and explains to us every art form.

Already in the essay on "Style" and in the Introduction, it was emphasized that art forms experience changes. Aside from the fact that the form must correspond to the ideal of beauty during the period considered, these changes occurred because the mode of execution, the materials, the tools, the means at command, and the requirements all have varied, and, further, because in different countries was added thereto the fulfilment of different purposes.

Hence, a structural basis influences forms, and it may therefore be deduced with certainty that new constructions must likewise yield new forms. More than in any earlier period our latest era has produced the largest number of such constructions (merely consider the results of the use of steel). What can be more logical than to maintain: *That if art is by construction supplied with so much that is entirely novel, there must arise from it new forms, and usually a new style.* If all these forms have not yet become perfected art forms, this can be explained by the reasons previously given, since mere utility first prepares them for art. The fact may also be emphasized that every development of form always proceeds slowly and imperceptibly.

Semper has the merit of having proved this axiom in his book "On Style," although in a somewhat indirect way. Like Darwin, he did not have the courage to fully complete his theories, and stopped at a symbolism of construction, instead of designating construction itself as the germ-cell of architecture. Construction always comes first, for no art form can originate without it, and the problem of art, which is to idealize existing objects, becomes impossible without the existence of the object.

The development of original art forms corresponding to modern construction thus depends on ourselves, and the possibility of creating such forms is afforded and made easier for us by the rich inheritance that we have received. The useful result of this discussion is a very simple one: "*The architect must always develop the art form from the construction.*" Modern mankind accordingly understands the immense importance of construction, and has assigned the most distinguished experts to its greater perfection. This domain has thus become so vast that it naturally leads to subdivision of the work; hence, the technical specialties of bridge construction, of railway construction, of girder construction, etc., which are now developed very rapidly.

Yet construction enters the domain of art, for the architect will select, specify, perfect, or invent the construction most naturally applicable to the edifice to be created by him and best suited to the art form to be produced. The means at command and the purpose of the building will always produce variation between the limits of mere utility and of artistic execution, but correct judgment will guide the influence of the architect or engineer.

Therefore, the engineer, who takes into account not the future art form, but only the statical calculation and the matter of cost, speaks a language unsympathetic to mankind, while the mode of expression of the architect remains unintelligible if he does not proceed from the construction. Both of these are great errors.

Since the engineer is seldom a born artist, and the architect is generally made an engineer, it is safe to assume that if art is in time to improve, the architect must extend his influence over the domain now occupied by the engineer, so that the correct esthetic requirements may be satisfied. The succession of preliminary utility and of art development will always occur, and in time will increase the unsatisfactory effect of the work of the engineer. There is no thought of lowering the status of the engineer, but great abilities in both lines are seldom combined in the same individual.

If the proposed art form is derived from the construction, the latter is further influenced by many other things, to be mentioned later. One of the most important elements may be taken as a strictly expressed requirement of our modern period, and may be discussed here. This is the time allowed for erection and the durability usually dependent thereon. It is a very general opinion, though in part entirely false, that modern methods of construction are greatly lacking in solidity, because they are very rapid. This is the result of speculation, which naturally has nothing in common with art, but is its greatest enemy. Yet if our modern construction be closely examined, we are easily convinced that the reverse is true, and that modern construction is suited to a definite problem, as well as to produce both economy of time in erection and durability, two opponents. Modern construction exhibits great results in this way.

In the methods of construction employed during all periods, there is an evident desire to assure to buildings the greatest possible stability and permanence in order to obtain eternal duration, one of the most important ground principles of architecture. After modern construction produced a complete change in the time of erection required, though the principle of durability remained the same in art, construction was required to solve this problem, and it was compelled to adopt new means to satisfy this requirement. These methods were chiefly the use of new materials and the introduction of machines. Their influence on art forms must certainly become apparent.

A further problem therefore falls to the architect, and

he not only has to plainly indicate the construction in the art form created by him, but he must also produce the conviction in the observer, that the material employed and the time of erection have both been properly expressed therein. Faults in this respect are only too numerous. Art forms, where the time of erection neither corresponds to the effect nor to the material employed, always have something untruthful or irritating. To this category belong consoles and corbels that support nothing, steel structures that bear the impress of stone forms or exhibit a latticed appearance, plastered exteriors that appear to be of stone construction, and most external details that seem to be other than they are.

But where the aim of the construction is to combine reduced time of erection with equal or greater solidity, and with artistic forms of equal worth, this must be accepted as correct and as required by the problem. An example will show the correctness of this view. For a prominent monumental edifice, a colonnade with an entablature is executed as the chief motive of the architectural treatment of the upper story. The building is constructed of horizontal courses of stone, which material is procured with great expenditure of time and money. Immense stone blocks, that recall the system of construction used by the ancient Romans, are employed for the lower members of the main cornice, being structurally necessary because the modillions of the entablature are wrought in them. The procuring and dressing of these blocks cause great sacrifices of time and money. This mode of execution should be termed the "Renaissance mode of construction," and a "Modern method of construction" with it, for the same problem. Stone slabs are employed for the external covering (plane surfaces) of the building. The volumes of these slabs being materially less, they may be of nobler materials, as in marble. The anchoring of these slabs would produce bronze knobs or rosettes. Anchored steel supports would be used to bear the strongly projecting cornice, divided in thin courses, and these supports would be covered with gilded bronze coverings in form of consoles. The result of this comparison would be, that the volume of stone-work would be from one fifth to one sixth that of first method, the number of ashlars would be less, the monumental effect would be enhanced by the nobler material, the amount of money required would be largely reduced, and the time of erection would not exceed the desired limit.

Here are certainly sufficient advantages to cause the preference of the modern method of construction in such a case. But the list of advantages is not exhausted, a greater one being that a number of novel artistic motives are produced, whose development is not only very desirable for the architect, but he must seize upon them with haste and zeal to truly make progress in the art. Results of this kind are not isolated, for every object without exception will yield them to the creative architect, if considered from similar points of view.

It must be natural for modern men, who prize the value of time, to promote those systems of construction that can satisfy their wishes in this respect. This again occurs by the use of materials quickly obtained and of good quality, by subdivision of the work, or by commencing different portions of the structure at the same time, so that a quicker method of erecting the edifice results. If the structure be substantial, it will supplant earlier methods in spite of an increased cost. It is evident that new forms must result from this procedure.

Ease in obtaining any material must vary in different countries, and, therefore, its use and the perfection of its treatment also vary. Thus, in certain countries some materials predominate, a fact that the architect can never neglect, since the aspiring ideal of beauty also requires "local character" (exteriors in brick, plaster, half-timber work, etc.).

One matter is in close relation to the time of erection of a building and requires mention, since most clients, and even the architect himself, are incorrectly informed in regard to it. This is the time required for the graphical, artistic, and structural working out of the project entrusted to the architect. The production of artistic works is partly empirical creation, and is but too frequently dependent on caprice and inspiration, but such work will never be so free from faults that the artist executing it could not indicate desirable changes (although usually too late).

For apartment houses, which owe their existence solely to a tendency to "investment of capital," the time during which the architect must complete his work is always so small, or is even limited to a few days, because the owner usually permits the building to be commenced immediately after employing the architect. For monumental buildings, a sufficient time is usually allowed to the architect for studying and completing his project so far as to make great changes unnecessary, and he even frequently enjoys the privilege, not sufficiently prized, of being able to properly take everything into consideration by means of a model of the edifice, before its erection is commenced. It is, therefore, proper to consider this fact in judging artistic works.

Among materials that particularly influence the modern fashion of architecture, steel naturally plays the chief part. Its structural forms accommodate themselves least to the multitude of forms transmitted to us. In the rich inheritance of art now available, we find almost nothing that would aid us in a beautiful treatment of the forms of steel. If there be a further adherence to the unsympathetic principle of mere utility connected with steel, it is not sufficiently considered that where art shapes this material, entirely novel forms are produced, and that one of the greatest impulses is thereby given toward the existence of the new style. The properties of steel are indeed so extraordinary that it is able to satisfy almost any requirement, and, therefore, in regard to the use of this material, only pecuniary limits need be considered. Its universality has led to its predominance, so inartistic and offensive a few years since. Other new materials, together with its incomplete and somewhat doubtful resistance to tests, as well as pecuniary reasons, have had a sobering influence, and have limited its use to correspond with the artistic views of modern mankind. There still remain many edifices structurally and esthetically affected by the use of steel, so that its existence and its influence on our present architectural system may be said to set a fashion.

(*To be continued.*)

Fire-proofing.

RATIONAL METHODS OF FIRE-PROOFING.

BY WILLIAM COPELAND FURBER,* M. AM. SOC. C. E.

THE experiments by James E. Howard (*Iron Age*, April 10, 1890, Kent's "Engineers Pocket Book," p. 382) indicate that steel has its maximum strength at about 400 degs. Fahr. These experiments are also confirmed by other experiments of a similar character (see *Journal of Franklin Institute*, CXII., p. 241).

Howard's experiments show that the strength is affected also by hardness of the steel, the hard steel having a higher resistance than the soft steel; thus he found that .10 per cent. carbon steel had a strength of 20,000 lbs. per square inch at 1000 degs. Fahr., and .60 to 1.00 per cent. carbon steel had the same strength at 1,600 degs. Fahr. These facts teach us that in order to preserve the integrity of the structure, the temperature of the framework should not be allowed to greatly exceed 400 degs. Fahr.

Fire-clay is a native combination of the hydrated silicates of alumina, mechanically mixed with silica and alumina in various subdivisions, and sufficiently free from the silicates of the alkalies and from iron and lime to resist vitrification at high temperatures. According to the authorities, fire-clay contains from 47 to 80 per cent. silica and from 17 to 48 per cent. alumina. Fire-clay is probably the most durable substance that can be applied to the protection of ironwork from heat. The knowledge, however, of its virtues has frequently led the architects and manufacturers to decrease the thickness of the covering of the ironwork to a point where it no longer answers its purpose in a satisfactory manner.

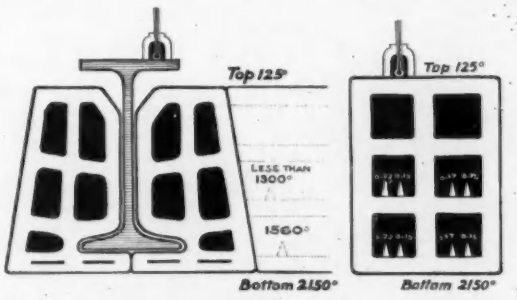
Since the substitution of ironwork for brickwork in the structural parts of a building, the tendency has been to restrict the space occupied to the minimum, and this has resulted in begrudging every inch required for fire-proof covering, and, as a consequence, in such cases the fire-proofing is no longer of sufficient thickness to fully insure that the ironwork will be properly protected in event of great heat.

The skeleton building has reduced the area of piers and columns to such a small part of the area formerly required that the other extreme has been reached in making the sections of the minimum dimensions, with the least possible allowance for thickness of fire-proof covering, and, as a result of this, at least some of the so-called fire-proofing is a mere pretense; for while it is true that the covering is fire-proof in the sense that it is non-combustible and almost indestructible itself under trying conditions, yet it is not thick enough to afford insulation to the metal within it, to preserve it, and the term "fire-proof" has become, therefore, a misnomer. In those instances where buildings have been subjected to severe tests and failure has resulted, the unthinking critic has condemned the *system* of fire-proofing, whereas the *method* only, was at fault.

The necessity for dead air space cells makes it more difficult to insulate the structural work by preventing any considerable conduction of heat from the point of application. A glass lamp chimney is kept below the melting point of glass because the heat of the flame is rapidly carried away by the upward current of air and by radiation, while if the heat were stored in it it would soon reach its melting point. The column and beam, not being able to give up their heat by conduction and radiation, store it up, and are, therefore, placed in an unfavorable position compared with the lamp chimney. The dead air space cells, however, play a very important part in fire-proofing, and are highly effective in the nonconduction of heat. Some authorities give the thermal conductivity of air as $\frac{1}{3500}$ part of that of iron; the data relating to these matters, however, is not complete, nor is that which is in existence in a very satisfactory shape. The value of dead air spaces, however, is very great, and the use of air-cells in terra-cotta fire-proofing is essential. Fire-clay with air-cells has many times the value of the solid material; it is evident, therefore, why they should be used in fire-proof coverings.

The value of air-cells as a nonconductor of heat is shown very clearly in the illustrations, taken from the catalogue of a prominent manufacturer, and will bear study by designers and manufacturers. Volumes might be written as to the behavior of fire-proofing under tests, but these illustrations contain more practical information than pages of general description of how a particular accident occurred, and why one place failed when another did not.

These experiments show that after a test of twenty-



EXPERIMENTS TO DERIVE THE TRANSMITTING POWER OF HEAT THROUGH HOLLOW TILES. CONDUCTED BY HENRY MAURER & SON.

five hours, with a final temperature of 2,150 degs. on the outside of the floor tile, a temperature of 1,560 degs. was found in the first cell adjoining the outside 1 in. of terra-cotta wall, and while twenty-five hours is a very severe test (for if time enough be given the whole mass would attain the same temperature), yet the reduction of heat is not sufficient to have maintained the full strength of the beam, even for a short time.

The temperature in the first air-cell is 1,560 degs. Fahr. If this temperature is obtained here, it is evident that the lower flange of the I-beam, which has not as much protection, is considerably hotter, and, as the temperature of the iron should not be allowed to greatly exceed 400 degs., it is apparent that this beam has lost a great part of its strength temporarily. The second cell shows a very much greater reduction in the temperature, and the top of the block shows a comparatively low temperature. The great capacity of the iron to absorb and transmit heat is shown in the temperature of the top flange of the beam,

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which is much higher than that of the terra-cotta. While this experiment was evidently made without scientific precision, yet it answers the purpose in an admirable way as illustrating the progress heat makes in going through the floor.

The cellular construction used in the body of the ordinary floor tile is wholly omitted about the flanges, and this is shown to be a mistake. The reason it is omitted is because it would make the floor thicker than usual, and this means that the building must be made higher, because the floor thickness would be increased.

The protection the beam should have is, of course, determined by the maximum temperature to which it is likely to be exposed, but in conflagrations temperatures of 2,500 degs. Fahr. are easily obtained.

S. Albert Reed (*Franklin Institute Journal*, November, 1896) estimated that the temperature of a fire at a lard refinery at 59th Street and Eleventh Avenue, New York, was 5,000 degs.

In the tests made by the committee of Fire Insurance Underwriters, the Architectural League, and the American Society of Mechanical Engineers in 1896, the committee decided to make tests on the following basis; 2,500 degs. for six hours, representing a conflagration; 1,200 degs. for one hour, representing a mild external fire; 700 degs. for one half-hour, representing a mild condition such as might occur in an office building or dwelling.

The building, to be effectually fire-proof, should be capable of resisting the probable maximum temperature, and, assuming that to be 2,500 degs., the ordinary covering is not sufficient.

It is quite possible to cover metal work in buildings so that the application of great heat for a short time shall not injure it, but in order to insure this, the covering must be thick enough.

The fire-brick lining of steel-melting furnaces is about 12½ ins. in thickness; the temperature of melting steel is about 2,900 degs., or 12½ ins. of fire-brick is required to insulate 2,900 degs. of heat. This thickness of lining insures that the hot steel shall not be chilled from the outer air, and also that the iron covering of a Bessemer converter shall not be reduced enough in strength to prevent it answering as a constructional envelope. This practical example gives us some basis for arriving at the thickness of covering necessary to protect the structural parts of a building.

The conditions of exposure, however, are greatly in favor of the steel converter, or the open hearth furnace, in this respect that, in these instances, the heat is conducted or radiated away from the outer walls into large volumes of air of ordinary temperature, which keeps their surfaces at a temperature corresponding to the capacity of the surrounding air to absorb it; while with a beam or column in a building, little or no opportunity can be afforded to conduct the heat away, because the air spaces must be "dead," that is, they *must not* be continuous, in order that, under no conditions, they could act as flues to conduct heat and fire along their length, and thereby defeat their purpose as a protective covering.

In buildings a covering of 1 in. of porous terra-cotta is all that protects the lower flanges of the I-beam; the girders usually have a trifle more, or a total thickness of 1½ to 2 ins. covering.

The experiments of Howard and others show that steelwork, to preserve its integrity, should not be allowed to attain a temperature exceeding 400 degs; 1 to 2 ins. of terra-cotta cannot prevent this. It is probably true that manufacturers are not wholly responsible for the thinness of their covering, but are compelled to follow the footsteps of the original designers, because architects have been accustomed to the previous shapes and forms, and will not make any changes in the direction of increased thickness, and, if this is true, the responsibility for the present insufficient methods must rest upon the architect's shoulders. Manufacturers cannot be expected to make things they cannot sell, and if the thin coverings are the only kind they can dispose of, then they are in a commercial sense blameless; nevertheless, a moral responsibility rests upon them to prove to their patrons the necessity for a greater thickness of covering to insure the result striven for.

IS A FIRE-PROOF STRUCTURE POSSIBLE?

THIS is a question which was asked of an architect in connection with buildings of the State institutions of Indiana. "A fire-proof structure is possible," was the answer. "Fire-proof buildings have been destroyed," was the reply, "and how do you prove your assertion?" The architect said, "Why not consider a cupola furnace? Here is a structure of steel and clay. Where is there a building which may be submitted to such heat, and yet we find the furnace a relatively permanent structure. Of course, this is not an architectural structure, yet it shows possibilities. It indicates that with steel structural supports and a proper use of burnt clay such a structure is indestructible."

Now, it is true that many buildings with a minimum of steel and a minimum of clay protection are quickly and easily destroyed by the burning of a large amount of combustible material on the interior, but who will say that it is not possible to protect a steel structure by the use of burnt clay when he considers the intense heat to which the cupola furnace is subjected? The protection is not relatively heavy, but the work is thoroughly done and well applied. No architectural structure, with the material which it contains in the state of combustion, is ever subjected to the heat which is applied in a cupola furnace. The coke furnaces of Pennsylvania and machinery of steel manufacturing indicate clearly enough that fire-proof construction is merely a question of adequate thought and adequate workmanship. Steel or iron in itself is a material more readily destroyed by fire than wood, yet steel adequately protected presents an absolutely fire-proof building.

Many of our buildings are adequately protected in the places where they need it the least; for instance, there is 8-inch fire-proofing between beams, and only one inch under them. The surface between beams needs the protection the least, and the surface under them or over them needs it the most, and yet it is there where they get it the least. If any one ever questions the possibility of absolute fire protection or fire-proof qualities of a structure, why not think of the cupola furnace or the coke oven? — *The Clay Worker*.

Selected Miscellany.

NOTES FROM NEW YORK.

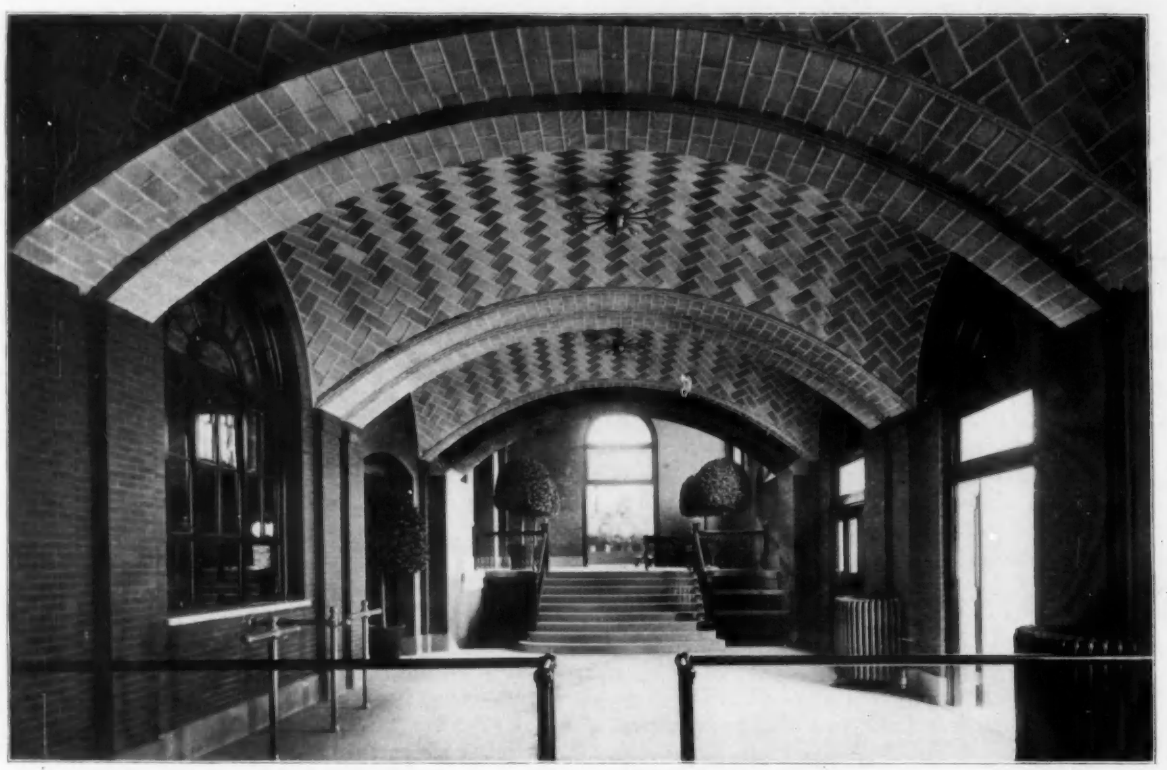
Hot! Well, I should say so! Although allusions to the weather may seem inappropriate in these columns, they will have to be excused this time, for no influence is affecting business so much at present as the awful heat, and perhaps no business will suffer so much by the delay necessitated as the building trade and its branches.

Down-town there are a great many old buildings being torn down to make way for new ones, and this work of demolishment is always trying in hot weather, but during the past week it has been impossible for the men to work, to say nothing of the horses, whose sufferings are even worse. A prosperous state of affairs still holds good with our architects, and the merry pencil pushers are all happy, for although the chance for liberal vacations is slim, there is a pecuniary compensation for those who deserve it that is eminently satisfactory.

A few items of new work follow: —

Bruce Price has filed plans for a twenty-story brick and stone office building to be built at 72 and 74 Broadway, to take the place of two small buildings which burned down about two years ago. The cost of the new building will be about $900,000.

Janes & Leo have prepared plans for three five-story stone and brick dwellings to be erected on 83d Street, at a total cost of $225,000.

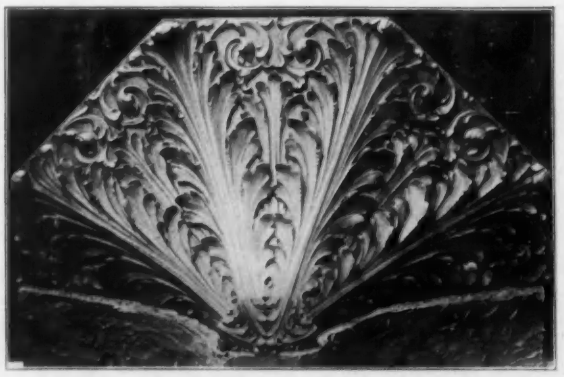


ENTRANCE, HORTICULTURAL HALL, BOSTON, MASS.
Wheelwright & Haven, Architects.
Showing tile ceiling executed by R. Guastavino Company.
(Another illustration of the Guastavino work in this building is shown in the half-tone plate form of this number.)

A twelve-story fire-proof building is to be erected at 140 West 42d Street, the site of the old St. Cloud Hotel. Bruce Price will be the architect for the building.

Clinton & Russell are preparing plans for a six-story factory building to be erected at Seventh Avenue and 16th Street, for the Oxley & Enos Manufacturing Company.

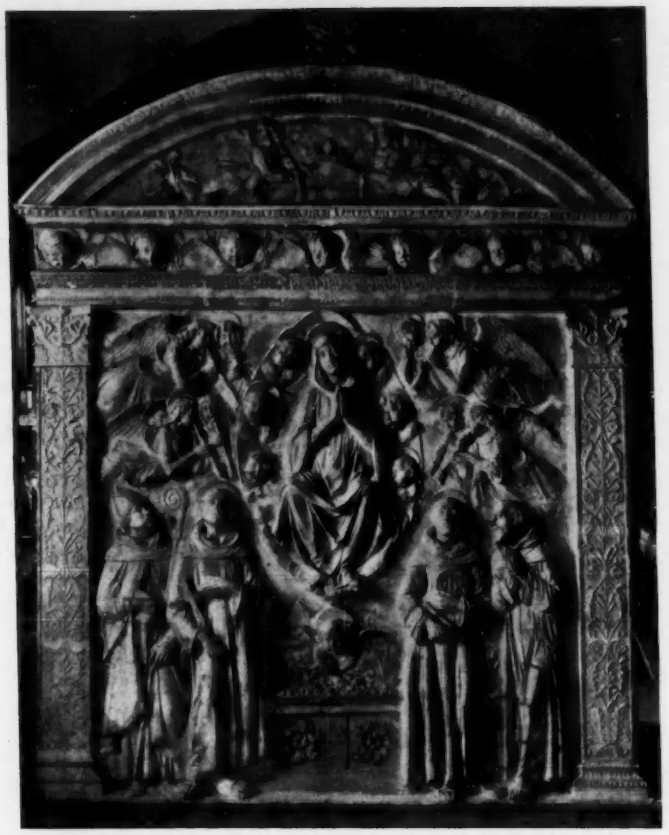
H. J. Hardenbergh has filed plans for an eleven-story brick and stone office building to be erected at Bridge and Pearl Streets, for the Maritime Building. Geo. A. Fuller Company will build it, and it will cost about $400,000.



WINDOW CORBEL, JAMES BROWN LORD, ARCHITECT.
Atlantic Terra-Cotta Company, makers.

James B. Baker has filed plans for the new Chamber of Commerce Building to be built on Liberty Street near Broadway; cost $500,000.

Renwick, Aspinwall & Owen have planned a twelve-story brick and stone hotel to be built on 44th Street; cost $200,000.



TABLET, EXECUTED IN FAIENCE, BY THE GRUEBY FAIENCE COMPANY.

The following New York architects have been invited by the supervising architect of the Treasury to submit competitive plans for the new building for the Department of Agriculture, the cost of which will be $2,000,000: Babb, Cook & Willard, Howells & Stokes, Carrere & Hastings, Brite & Bacon, and John Russell Pope.

NOTES FROM CHICAGO.

Robert Watson Bruce was this week appointed county architect by the Board of Commissioners of Cook County. As is well known, Mr. Watson is also State architect.

Governor Yates has appointed Fridolin Oswald, of

DETAIL BY THOM & WILSON, ARCHITECTS.
White Brick and Terra-Cotta Company, makers.

Alhambra, Madison County, a member of the Board of Examiners of Architects in place of William Carbys Zimmerman, of Chicago, resigned.

The old buildings at 225–227 Michigan Avenue are being removed preparatory to beginning the construction of the addition to the Auditorium Annex. The building will be twelve stories, and will cost $800,000. Holabird & Roche are the architects.

John Devereux York, architect and illustrator, has just returned to Chicago from a year's visit to Japan, and is considering two plans for the future. It is possible he will return to the practice of architecture in the

DETAIL BY GEORGE F. PELHAM, ARCHITECT.
New Jersey Terra-Cotta Company, makers.

office of Henry Ives Cobb, with whom he was formerly associated, or he may go to South Africa as an illustrator for Scribner's, with whom he was also associated, and in whose interest he has visited many parts of the world.

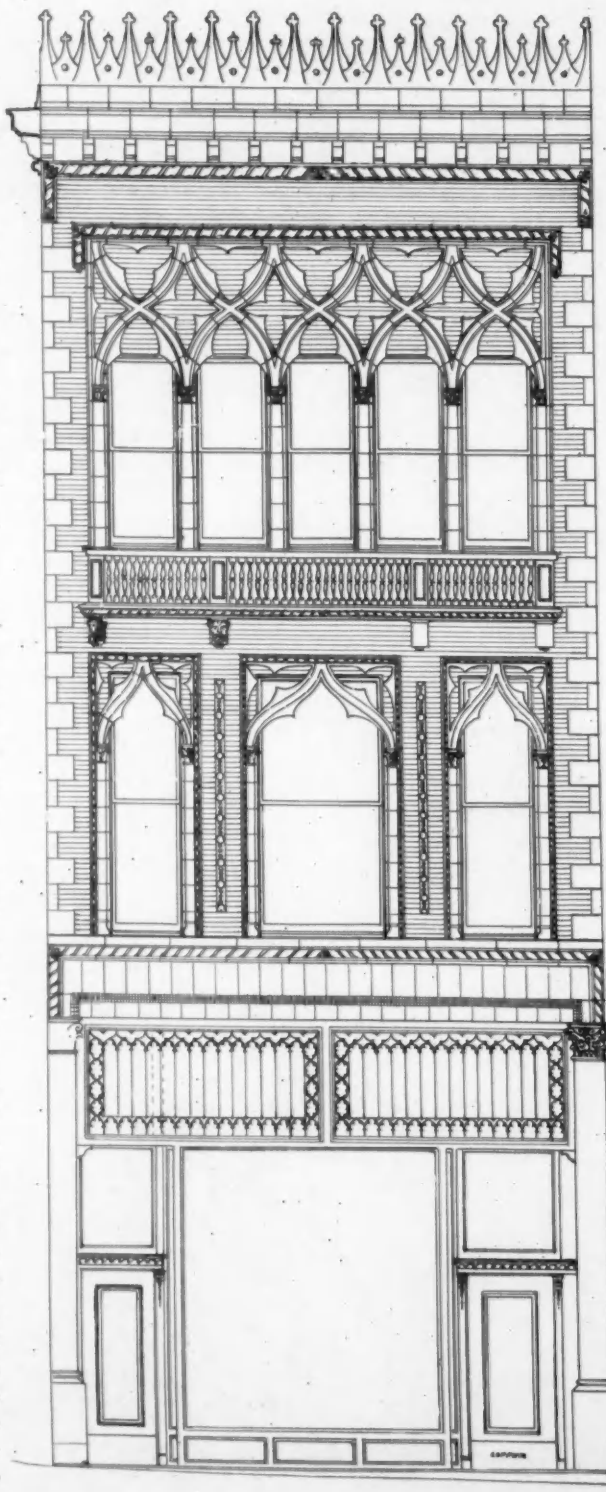
Nimmons & Fellows have made preliminary plans for the eight-story hotel and sanitarium which it is proposed to build at the northwest corner of Michigan Boulevard and Eldridge Court. A number of well-known surgeons and physicians are interested in the project.

OFFICE BUILDING FOR THE NEW YORK AND NEW JERSEY TELEPHONE COMPANY, BROOKLYN, N. Y.
Front brick made by Sayre & Fisher Company; Architectural terra-cotta by Perth Amboy Terra-Cotta Company.
R. L. Daus, Architect.

The Chicago & Western Indiana Railroad will next year begin the construction of a new depot on the site of its present one, Dearborn Station, at Dearborn and Polk Streets, the cost of which will be between $2,000,000 and $3,000,000. It is possible that land will be acquired on both sides of the present station for additional space on which to build. Official announcement of the intentions of the company was made at the meeting of the board of directors recently held.

The eighty odd concrete piers, resting on hard-pan, over 80 ft below datum, which are to support the new Field Retail Building, are completed, and the caisson work for similar foundations for the new Tribune Building is well advanced. It is doubtless safe to say that this absolutely permanent and unyielding type of underpinning will largely supersede piling or "floating" foundations for first-class high buildings in Chicago.

The following paragraph appeared in a recent number of the *Construction News*: "Architects whose specialty is designing and constructing beautiful homes should find cause for congratulation in the status of affairs in Chicago at the present time. From a financial standpoint, professional practice of this sort, unless one receives more than the ordinary commission, is unremunerative; but from an artistic standpoint and from a social aspect, it presents opportunities rarely to be found in architectural practice. This dissatisfaction from a pecuniary view is due to the whims of the opulent, who are sensitive about their homes as they are about nothing else and demand that the architect earn his salary twice over. It is believed that they could be shown how essential it is that the practice of one's profession involving so much learning, combined with rare good taste, should be more profitable than the ordinary class of construction, and for this reason it should be possible to obtain much better commissions. It is said that there are some architects who are constantly in receipt of 7 per cent. for this class of work, and even then they consider that they are none too amply compensated."



COMMERCIAL BUILDING, 620 LOCUST STREET, ST. LOUIS, MO.
C. S. Holloway, Architect.

The Architectural League of America having elected as president for the ensuing year Joseph C. Llewellyn, of Chicago, the choice of the remaining members of the executive board devolved upon the executive committee of that club of which he is a member.

Said executive committee now desires to announce that they have filled the executive board by the reappointment of the members who served last year.

The board is as follows: President, Joseph C. Llewellyn, Chicago; vice-president, Richard E. Schmidt, Chicago; corresponding secretary, Emil Lorch, Chicago; recording secretary, Hugh M. G. Garden, Chicago; treasurer, August C. Wilmanns, Chicago; members of executive board, Prof. Newton A. Wells, Urbana, Ill., and Robert C. Spencer, Jr., Chicago.

NOTES FROM SAN FRANCISCO.

The rush of work, such as now prevails in our architects' offices has not been experienced for the past ten years.

Bliss & Faville are the architects for a new hotel to be constructed by the Crocker estate. It will be ten stories high and fire-proof. The first story is to be of a light-colored stone, and the upper stories of brick and terra-cotta in the French Renaissance style. Its cost will exceed $1,000,000.

A bill was passed by the last legislature making it necessary for all architects to take out licenses to practise in California, and for those entering the profession after March, 1901, to pass an examination in design, construction, and the determination of the investment value of buildings. A very capable board of examiners for the northern district, consisting of Seth Bab-

son, Henry A. Schulze, William Curlett, and Lionel Deane, has been appointed by the governor.

Willis Polk, one of our best local designers, is now associated with D. H. Burnham & Co., Chicago. He was associated here with the late George W. Percy.

John G. Howard, of New York, has been appointed the architect for the Mining Building at the University of California. He was the winner of the fourth prize in the Phoebe Hearst Competition.

Theodore F. Laist, one of the designers in the government architect's office, has lately been on a trip here on business connected with the new San Francisco post-office. Mr. Laist is well known in San Francisco where he made a name as a designer of great versatility.

Mayor Phelan has donated a public library building

DETAIL BY BROWN & VON BEREN, ARCHITECTS.
New York Architectural Terra-Cotta Company, makers.

to the city. It will cost about $20,000, and be of Roman brick and terra-cotta. William Curlett is the architect.

Newton J. Tharp has been appointed architect for a monument to commemorate Dewey's victory. It will be located in Union Square, and will cost $45,000.

NEW TRADE CATALOGUE.

ANOTHER valuable work for the architects' and builders' "Trade Library" is the new catalogue issued by the American Enameled Brick and Tile Company, 1 Madison Avenue, New York.

The valuable catalogue (all catalogues are not valuable) is one that contains essential facts regarding the business it represents, put into concise and intelligible form. It is the result of observation and study by those who are most interested, and, as has been stated before, is a text-book on the particular line of manufacture it represents. As such it is of immense value to the busy architect or builder who needs it for ready reference.

We need say little more than that the new catalogue issued by the above-named company meets all these essentials. It presents their manufacture of enameled brick in an interesting and instructive manner, and should be possessed by all who are in any way interested in the rapidly growing demand for this material.

ATHERTON BUILDING, LOUISVILLE, KY.
Faced with Hydraulic-Press Brick Company's buff enameled brick.
Dodd & Cobb, Architects.

SUNDRY ITEMS.

D. A. Crone, 1133 Fayette Street, Allegheny, Pa., desires architects' samples and catalogues.

The Atlantic Terra-Cotta Company has been awarded the contract by the George A. Fuller Company for the Flatiron Building, Fifth Avenue and Broadway and 22d and 23d Streets, New York City, D. H. Burnham & Co., of Chicago, architects. The company is making an extensive increase in its plant.

The new power station for the Edison Company, at Brooklyn, N. Y., will be roofed with Ludowici Tile, Meeker, Carter & Booraem, New York agents.

Meeker, Carter & Booraem are supplying the enamel brick which are being used in St. Joseph's School, 87th Street, New York City, Schickel & Ditmars, architects.

The brick used in the construction of the new St. Michael's Church, Brooklyn, R. F. Almirall, architect,

SWISS COTTAGE, CINCINNATI, OHIO.
Roofed with "American S." Tile.
William W. Franklin, Architect.

SPANDREL, CARNEGIE LIBRARY, LINCOLN, NEB.
Northwestern Terra-Cotta Company, makers.
Fisher & Laurie, Architects.

and the new building for the American Express Company, Madison Avenue, New York, S. Huckel, architect, are being supplied by Meeker, Carter & Booraem.

Akron Star Brand Cement is being used in the following new work: Y. M. C. A. Building, Medina, N. Y.; for street paving at Gloversville, N. Y.; also on extensive work for the B. & O. R. R., in the States of Ohio and Indiana.

Henry Maurer & Son have put up at the Buffalo Exposition a building which is of burnt clay throughout and

DETAIL BY HARDE & SHORT, ARCHITECTS
Excelsior Terra-Cotta Company, makers.

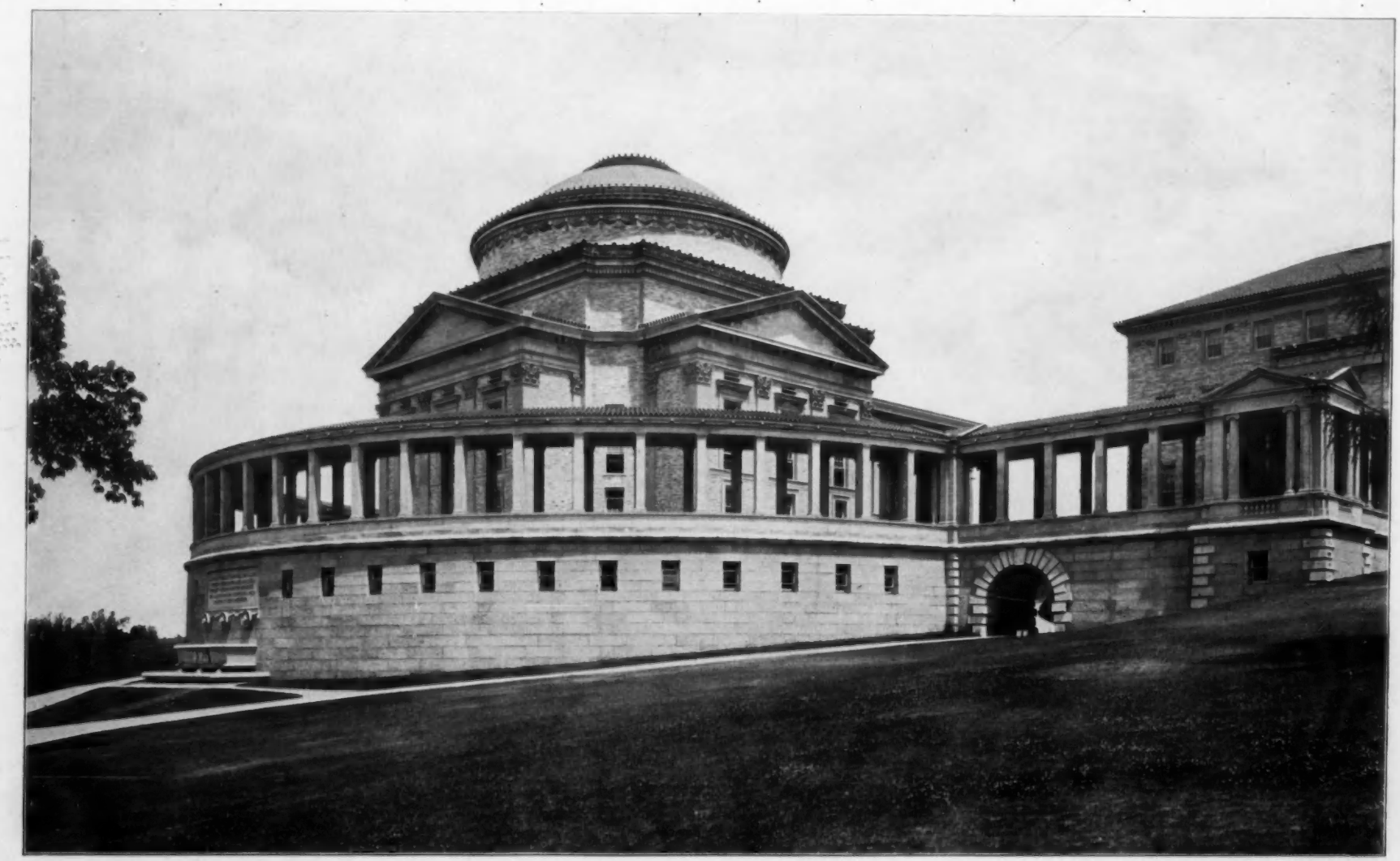
absolutely fire-proof. The fact that it is visited by thousands of people every day indicates the interest that the public takes in matters of this kind. It was an expensive undertaking, and Messrs. Maurer & Son are to be commended for their liberality and enterprise in presenting to the public so practical a demonstration of fire-proof construction.

LOCAL COLOR.

COMPARISONS, though invidious, often help us to appreciate our blessings. An architect, recently returned from abroad, has expressed himself as being particularly struck with what he chooses to term the absence of local color in the street architecture of Paris as compared with the civic aspect of Boston, and for that matter of many of the American cities. The prevailing building medium in Paris is the Caen stone, which is one of the most beautiful of building materials when fresh and clean-cut, but which, like nearly every stone known to the building trades, becomes speedily very dirty, and catches all the impurities which are so rife even in a city as clean as Paris. The extensive use of brick in our public work has infused a note of color whose value we often do not fully appreciate. There is much to be desired, and everything to be hoped for, as regards pure design; but when it comes to any question of local color,

SPANDREL, GARRICK THEATRE, PHILADELPHIA, PA.
Conkling-Armstrong Terra-Cotta Company, makers.
Willis G. Hale, Architect.

it is hard to gainsay the position our architecture occupies. A brick building will keep clean indefinitely, supposing, of course, that the proper kinds of bricks are used in the beginning; and it is not only easy to impart a strong local color to our architecture, but it is inevitable that that local color should be both abundant and of constantly increasing value. Bricks and terra-cotta offer a range in tones such as can be found in no other material; and when the time arrives that the average of excellence of our public buildings is, on the whole, as high as the average abroad, it is fair to predict that the appearance of our future cities will be extremely interesting, full of local color, and at once beautiful and enduring.



LIBRARY OF THE NEW YORK UNIVERSITY, NEW YORK, N. Y.

McKim, Mead & White, Architects.

HORTICULTURAL HALL, BOSTON, MASS.

WHEELWRIGHT & HAVEN, ARCHITECTS.

AN INTERIOR VIEW, HORTICULTURAL HALL, BOSTON, MASS.

WHEELWRIGHT & HAVEN, ARCHITECTS.

CLINICAL AMPHITHEATRE OF THE MEDICO CHIRURGICAL HOSPITAL, PHILADELPHIA, PA.

FRANK MILES DAY & BRO., ARCHITECTS.

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LIBRARY OF THE NEW YORK UNIVERSITY, NEW YORK, N. Y.

McKIM, MEAD & WHITE, ARCHITECTS.

ENTRANCE TO THE ANNAPOLIS, MD., POST OFFICE.

JAMES KNOX TAYLOR, SUPERVISING ARCHITECT.

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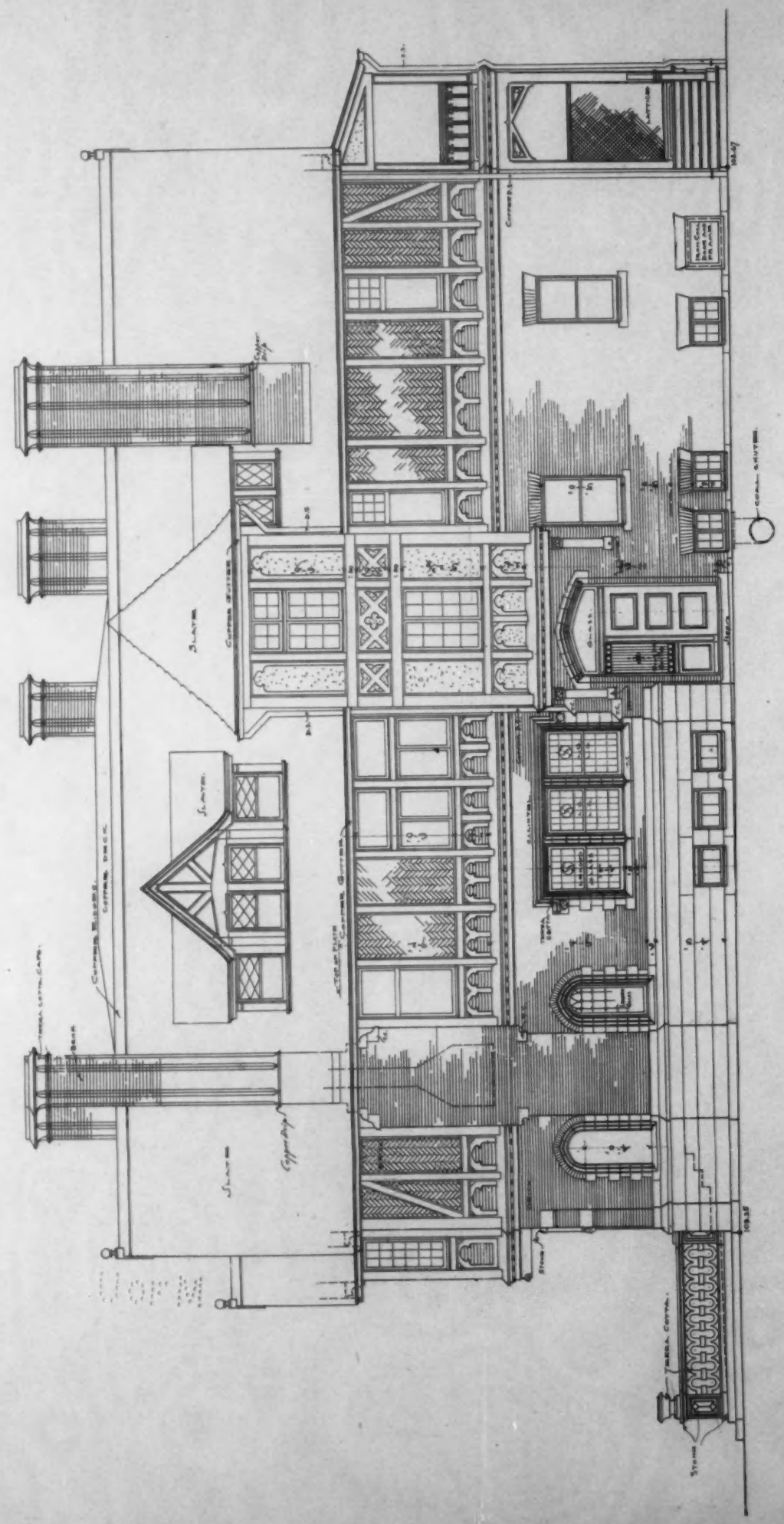
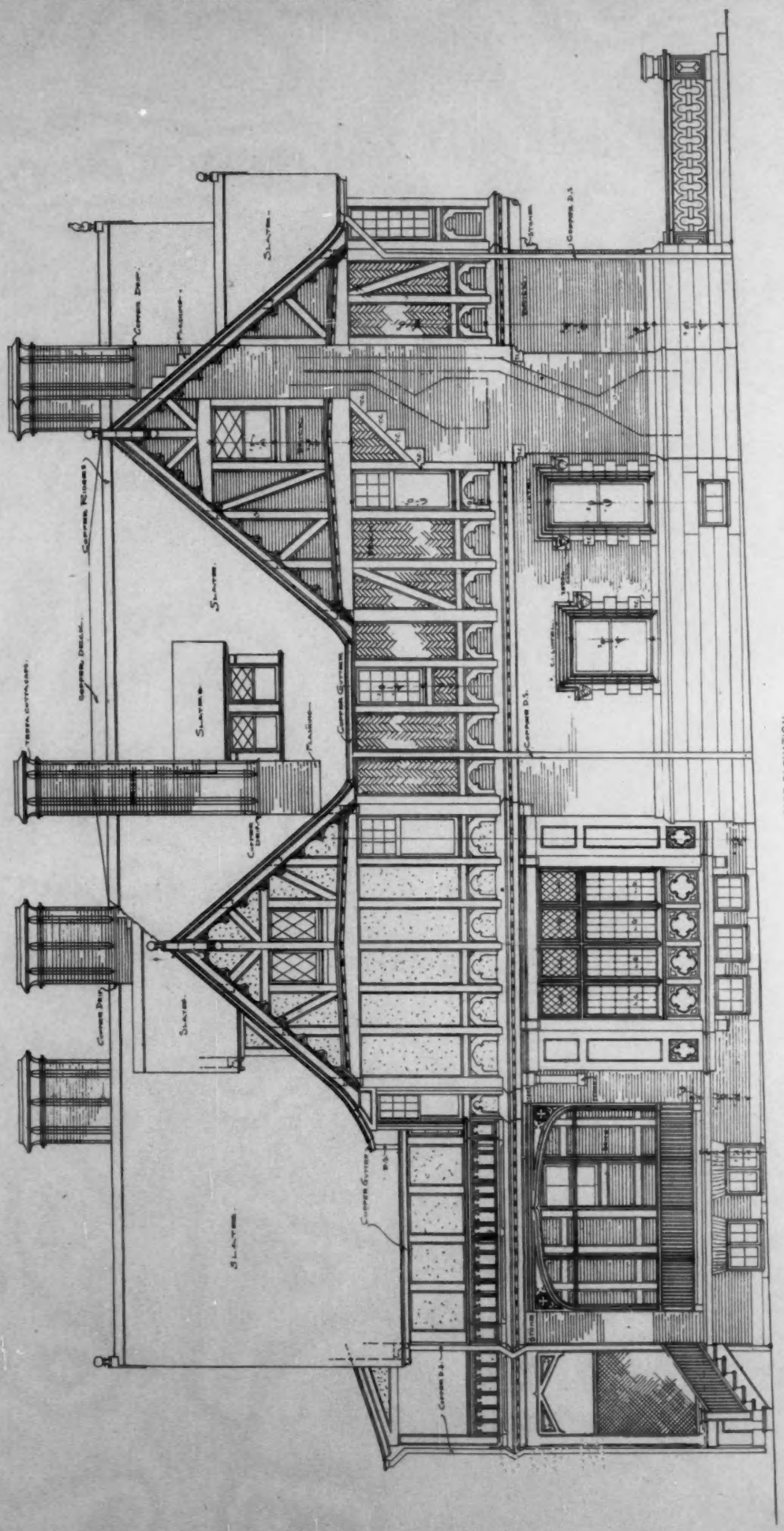


WEST ELEVATION.

HOUSE AT ST. LOUIS, MO.

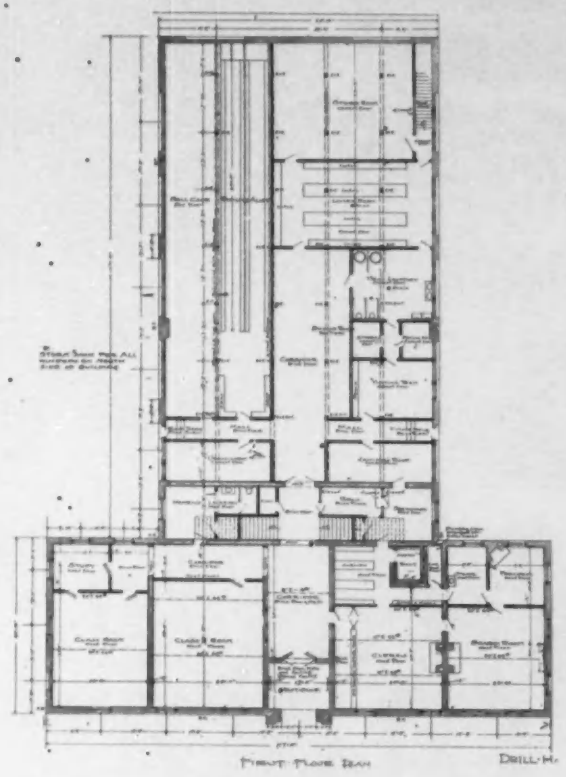
MAURAN, RUSSELL & GARDEN, ARCHITECTS.



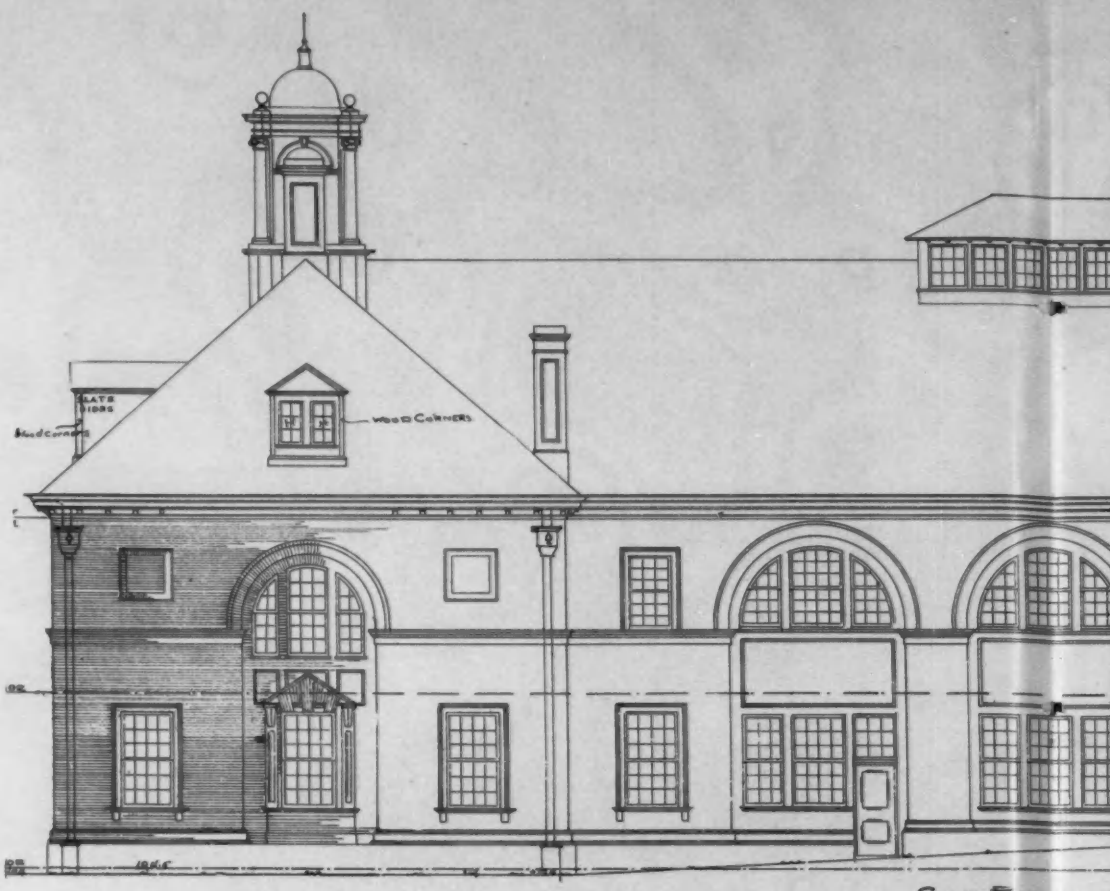
EAST ELEVATION.

HOUSE AT ST. LOUIS, MO.

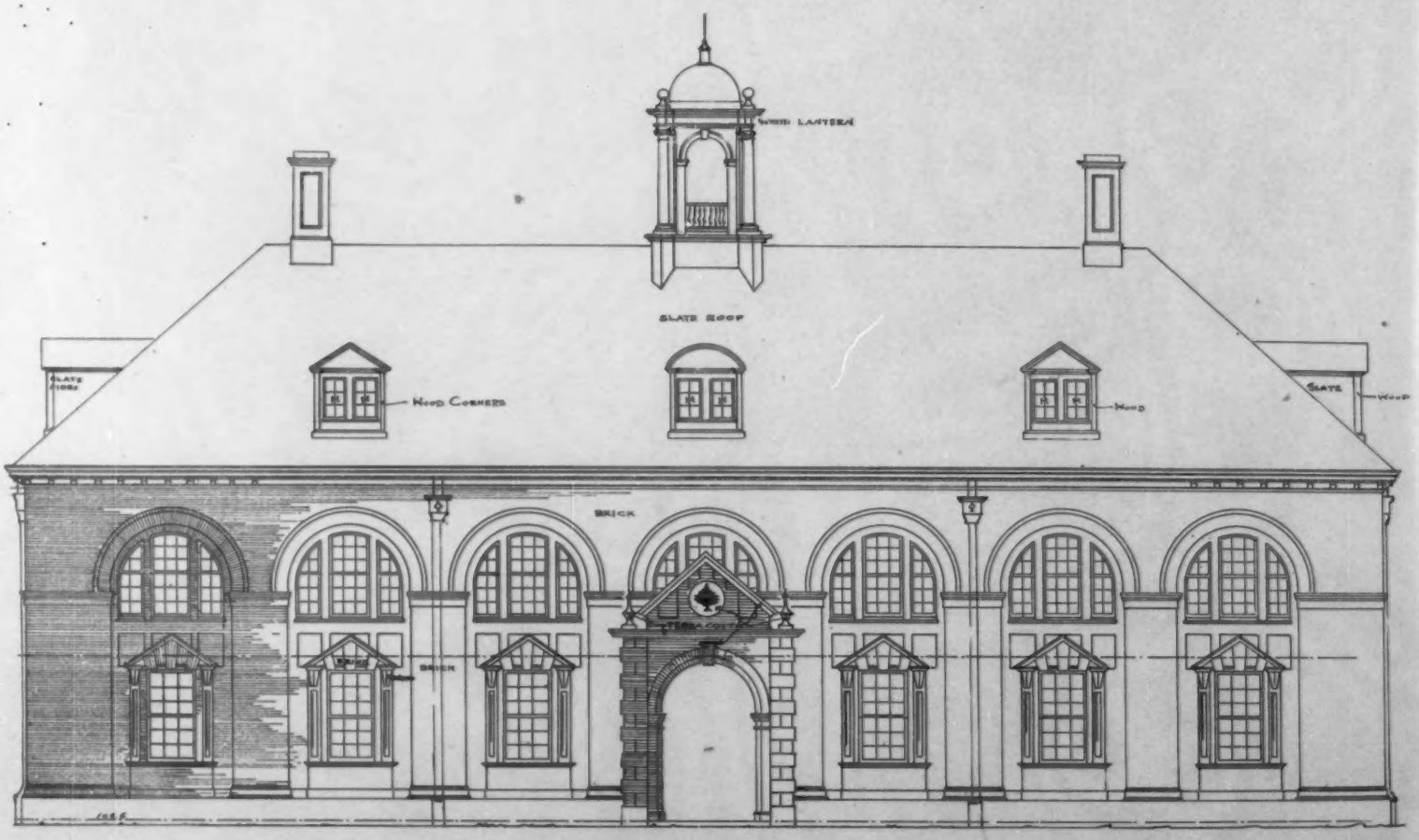
MAURAN, RUSSELL & GARDEN, ARCHITECTS.



FIRST FLOOR.

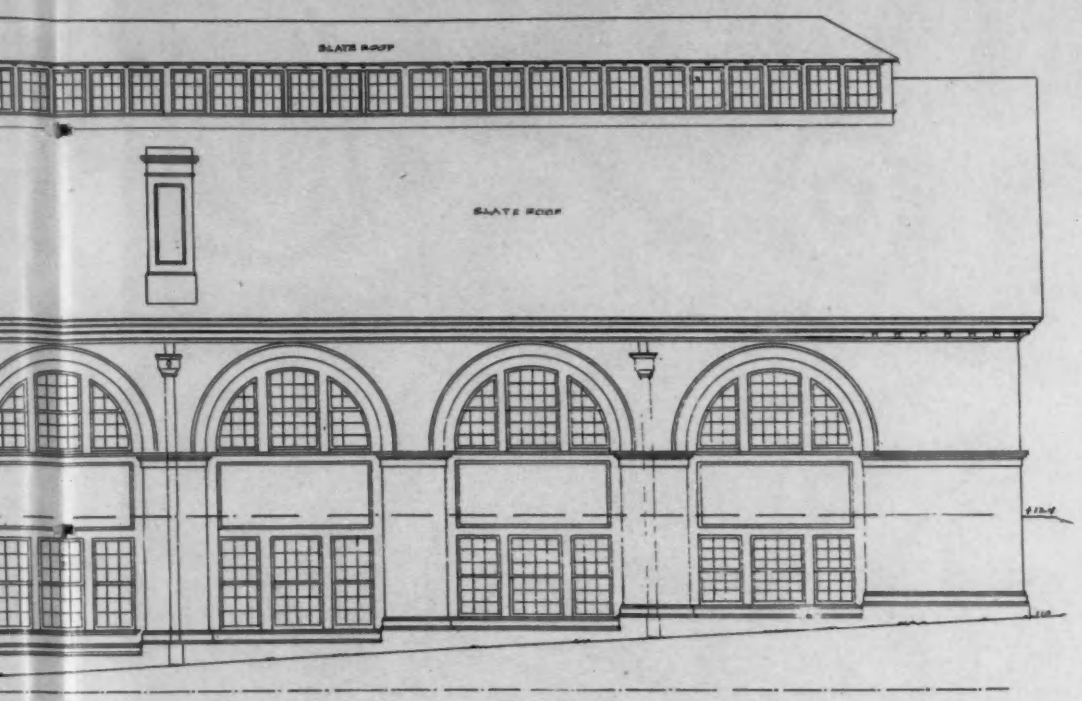


SIDE ELEVATIO

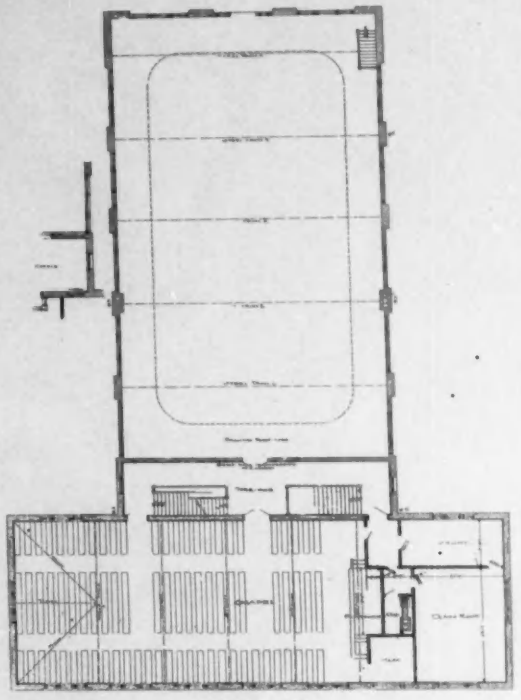


FRONT ELEVATION

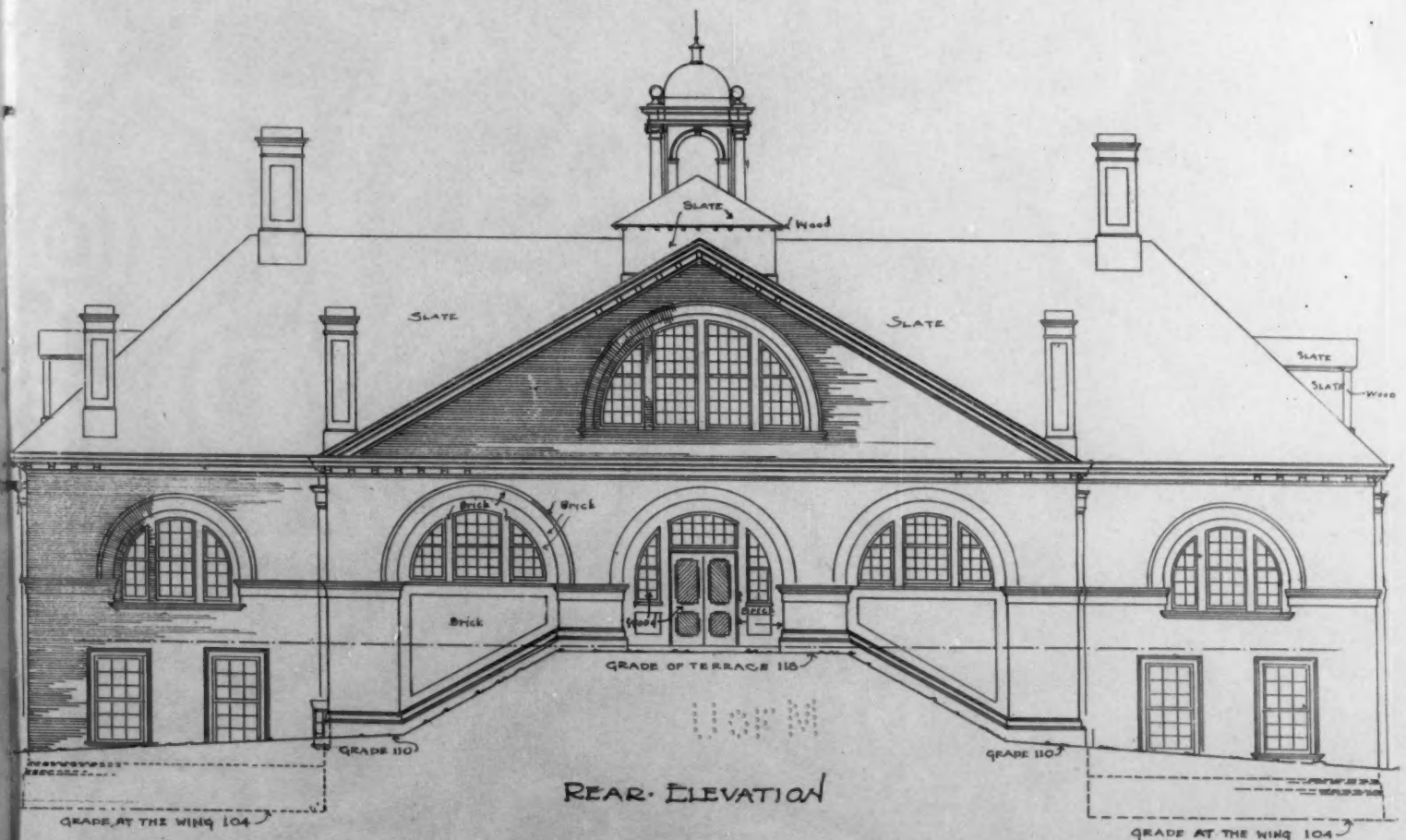
DRILL HALL AND GYMNASIUM FOR IVER
NEWMAN, WOODMAN & RRIS, A



ELEVATION



SECOND FLOOR.

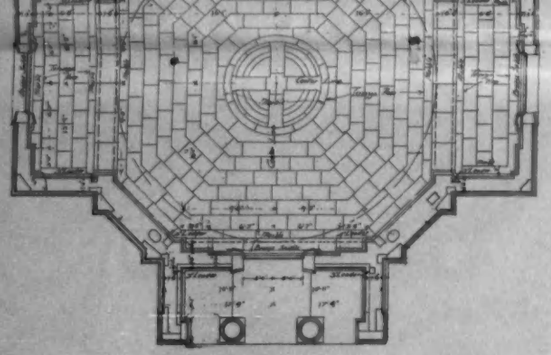


REAR. ELEVATION

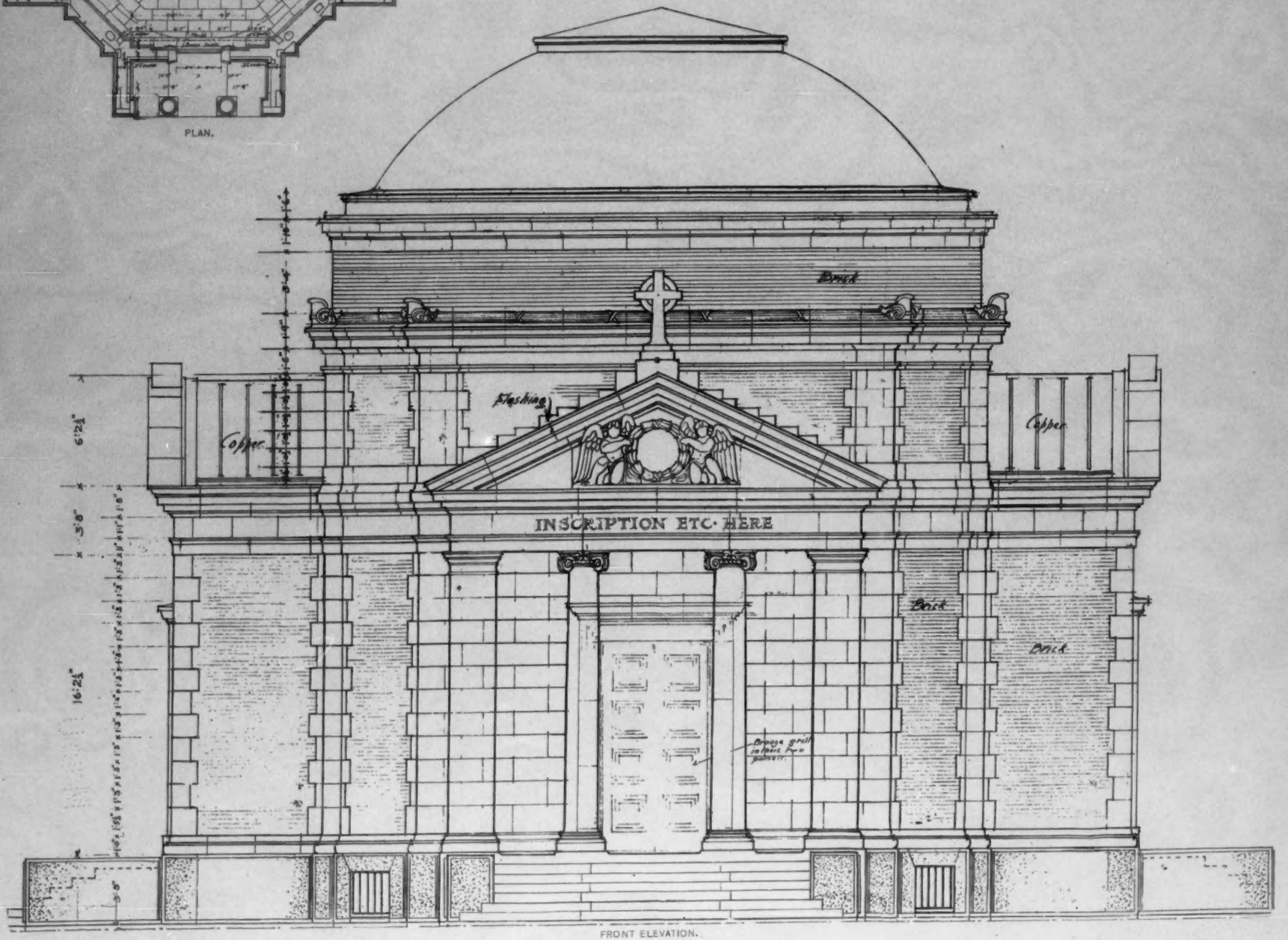
I FOR IVERSITY OF MAINE, ORONO, ME.

OODMAN & RRIS, ARCHITECTS.

SIDE ELEVATION.



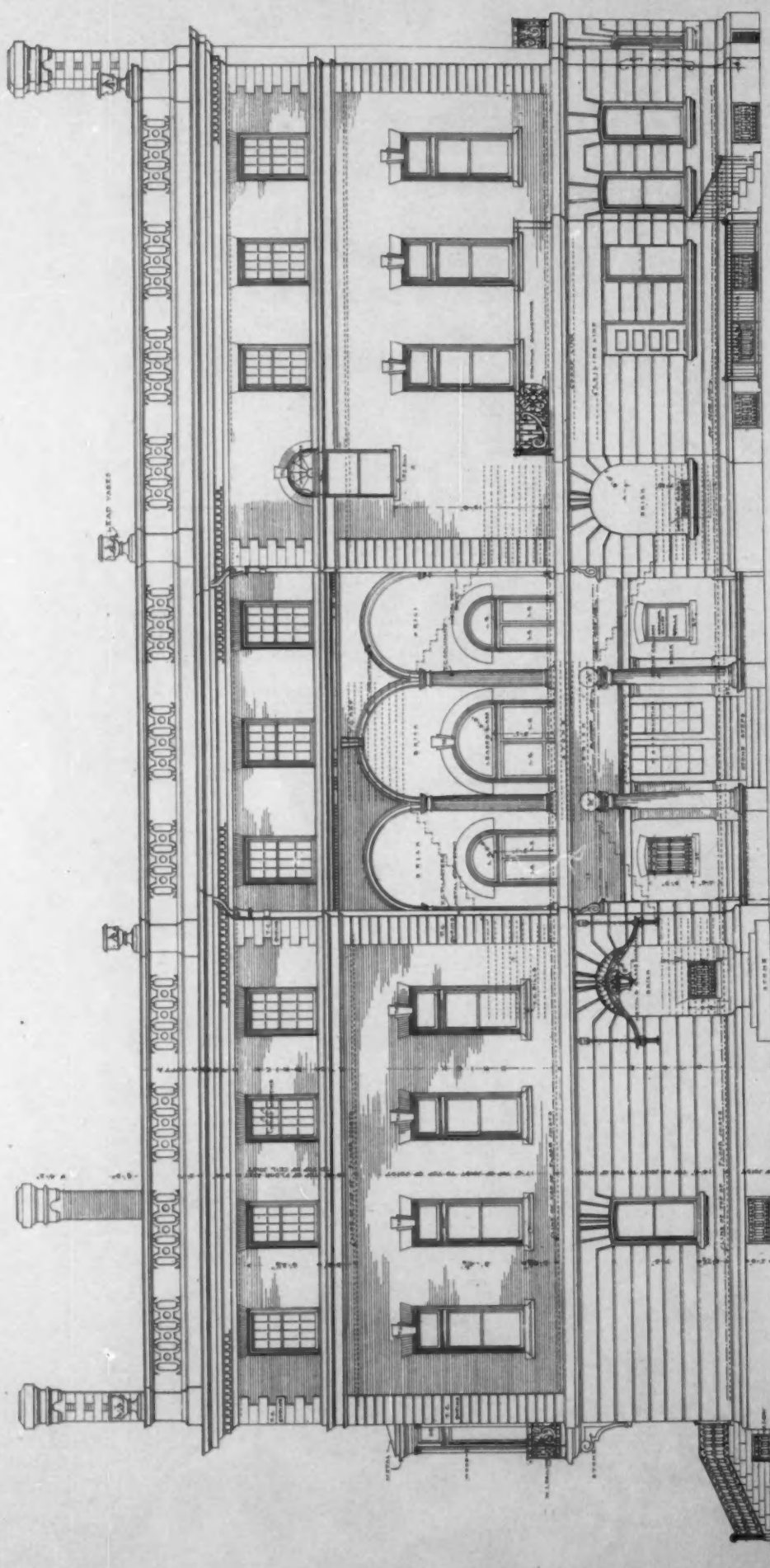
PLAN.



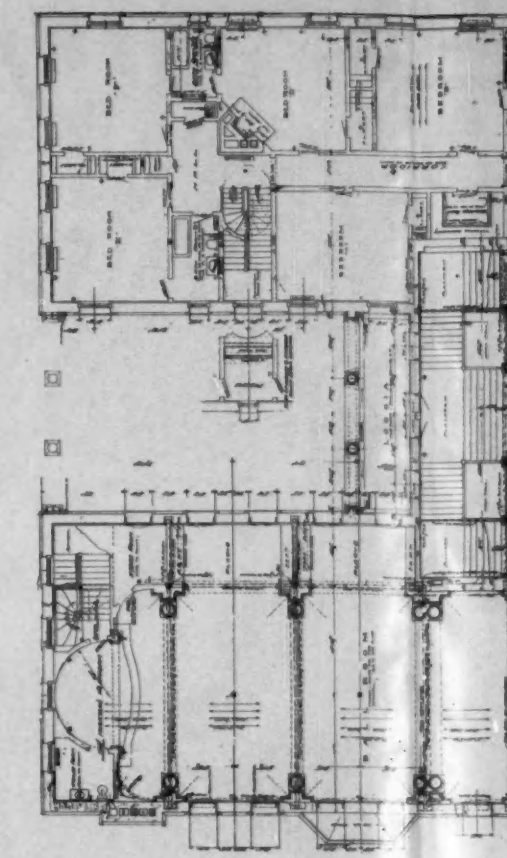
FRONT ELEVATION.

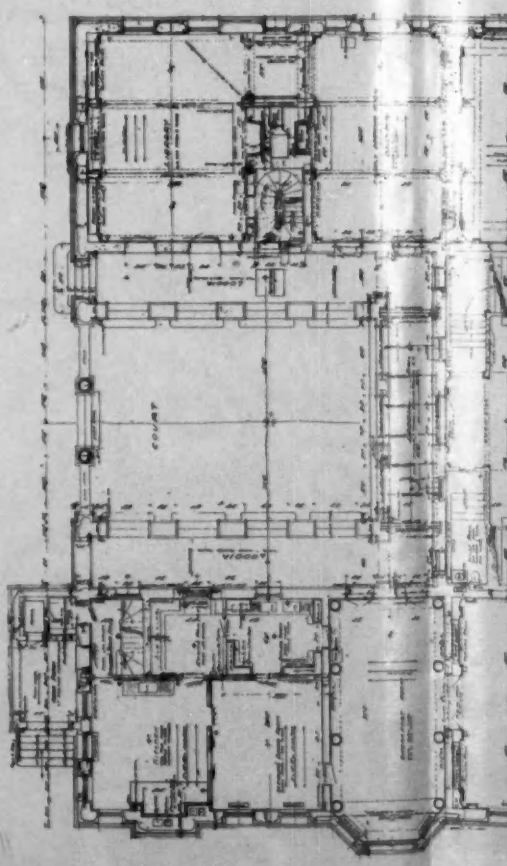
MORTUARY CHAPEL, NEW BRITAIN, CONN.

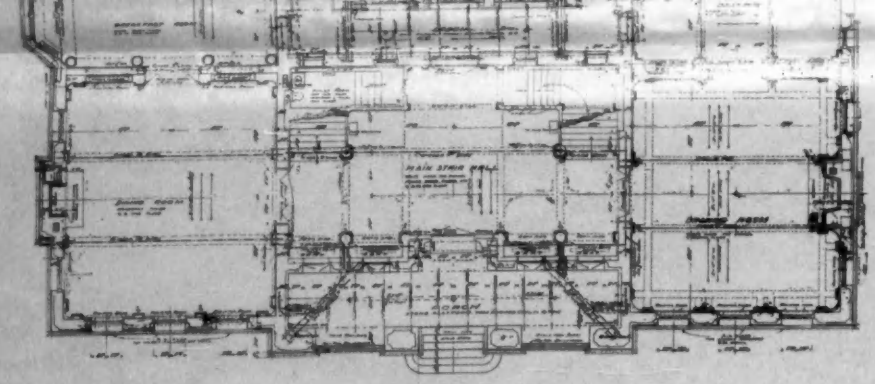
BRITE & BACON, ARCHITECTS.



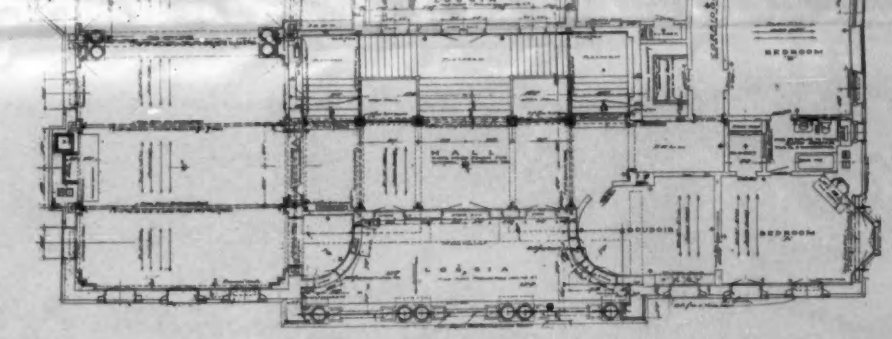
REAR ELEVATION.



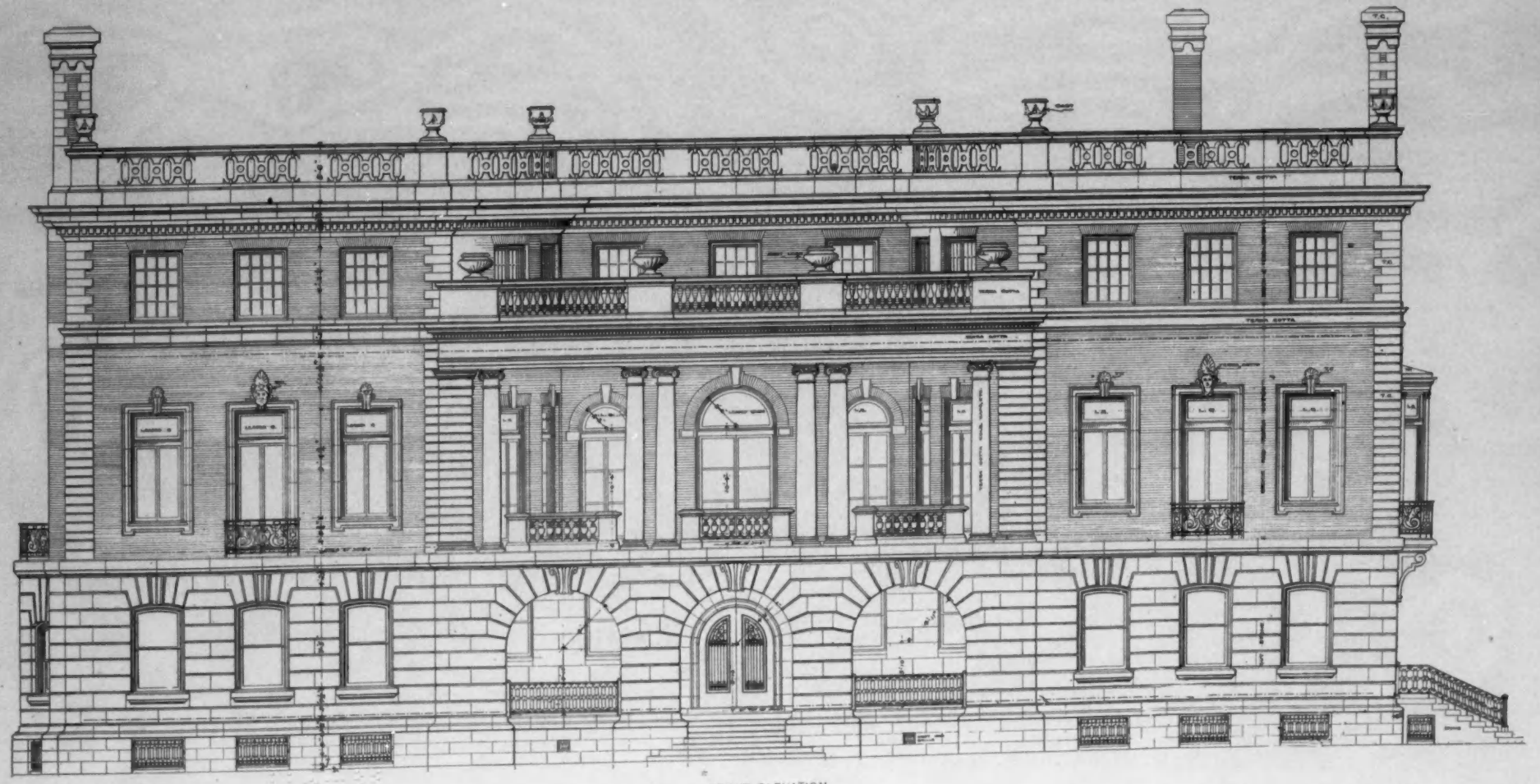




FIRST FLOOR PLAN.



SECOND FLOOR PLAN.



FRONT ELEVATION.

HOUSE AT CLEVELAND, OHIO.

FROST & GRANGER, ARCHITECTS.